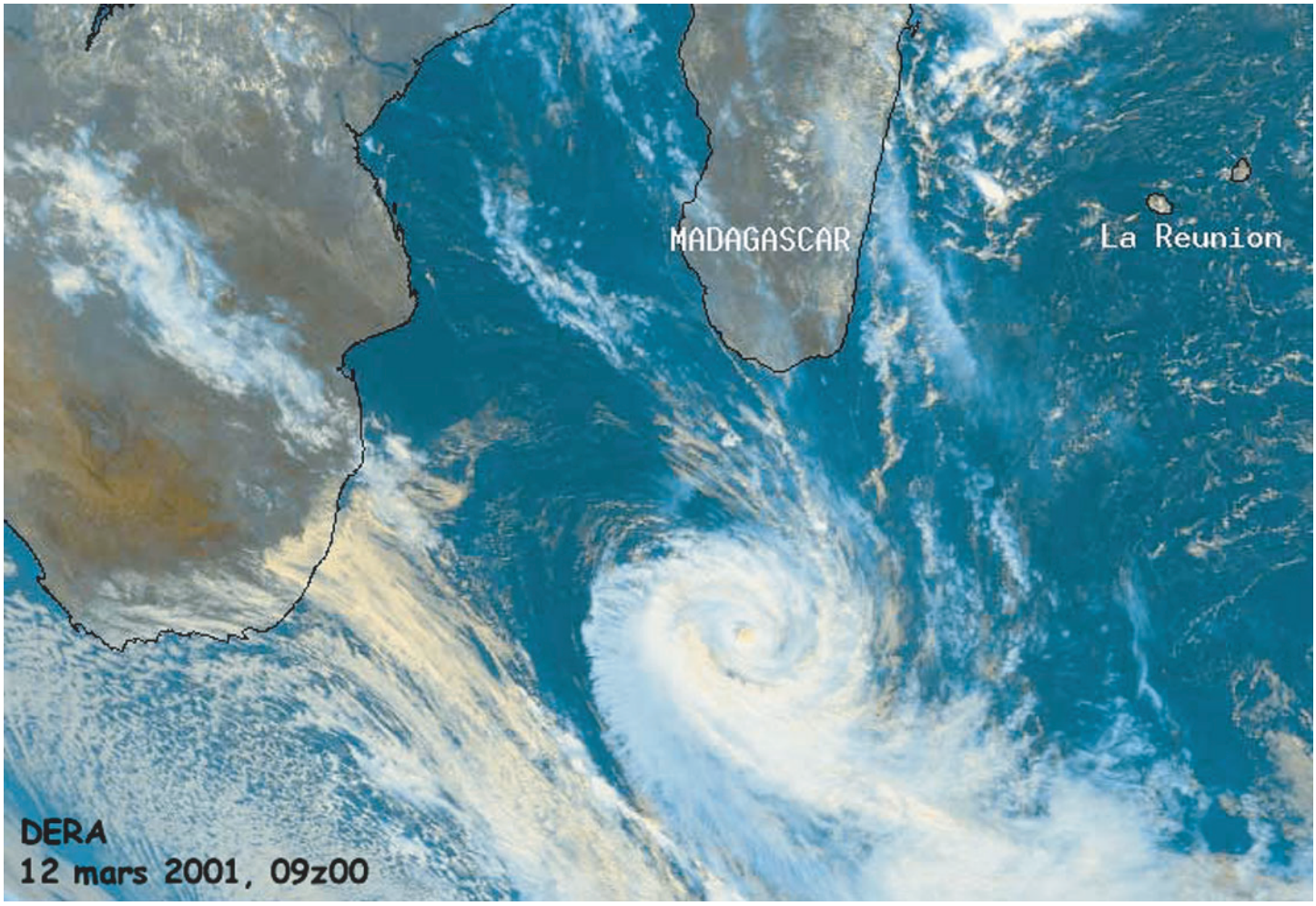
SWIFT

Rapport de Mission



Durban - La Réunion
14 février / 21 mars 2001
N/O Marion Dufresne

Adresses de l'équipe scientifique

HUMLER Eric
Laboratoire de Géosciences Marines
IPGP case 89
4 place Jussieu, 75252 Paris cedex 05
tel = 33 (0)1 44 27 50 88
fax = 33 (0)1 44 27 39 11
humler@ccr.jussieu.fr

MEVEL Catherine
Laboratoire de Géosciences Marines
IPGP case 89
4 place Jussieu, 75252 Paris cedex 05
tel = 33 (0)1 44 27 51 93
cam@ccr.jussieu.fr

AGRINIER Pierre
Laboratoire de Géochimie des Isotopes Stables
IPGP et Université Paris 7
2 place Jussieu
75251 Paris Cedex 05 France
tel = 33 (0)1 44 27 28 11
fax = 33 1 44 27 28 30
piag@ccr.jussieu.fr

CANNAT Mathilde
Laboratoire de Géosciences Marines
IPGP case 89
4 place Jussieu, 75252 Paris cedex 05
tel = 33 (0)1 44 27 51 92
fax = 33 (0)1 44 27 39 11
mac@ccr.jussieu.fr

CARTIGNY Pierre
Laboratoire de Géochimie des Isotopes Stables
IPGP et Université Paris 7
2 place Jussieu
75251 Paris Cedex 05 France
tel = 33 (0)1 44 27 28 11
fax = 33 1 44 27 28 30
cartigny@ipgp.jussieu.fr

ESCARTIN Javier
Laboratoire de Géosciences Marines
IPGP case 89
4 place Jussieu, 75252 Paris cedex 05
tel = 01 44 27 46 01
fax = 33 (0)1 44 27 39 11
escartir@ccr.jussieu.fr

GAUTHERON Cécile
Laboratoire de Géochimie-Cosmochimie
IPGP - T15, 3ème étage
4 place Jussieu, 75252 Paris cedex 05
tel = 33 (0)1 44 27 48 05
gauthero@ipgp.jussieu.fr

ILDEFONSE Benoît
Laboratoire de Tectonophysique
ISTEEM, CC 49
Université Montpellier II
34095 Montpellier cedex 5
tel = 33 (0)4 67 14 38 18
fax = 33 (0)4 67 14 36 03
benoit@dstu.univ-montp2.fr

KENT Adam
Danish Lithosphere Centre
Oester Volgade 10-L
Copenhagen K, DK-1350
DENMARK
tel = (+45) 38 14 28 67
fax = (+45) 33 11 08 78
ajrk@dlc.ku.dk

LUND Jacob
Danish Lithosphere Centre
Oester Volgade 10-L
Copenhagen K, DK-1350
DENMARK

NICOLAJSEN Suzanne
Danish Lithosphere Centre
Oester Volgade 10-L
Copenhagen K, DK-1350
DENMARK
suzanne_nikolajsen@yaohoo.dk

PEATE David
Danish Lithosphere Centre
Oester Volgade 10-L
Copenhagen K, DK-1350
DENMARK
tel = (+45) 38 14 26 64
fax = (+45) 33 11 08 78
dwp@dlc.ku.dk

POULSEN David
Danish Lithosphere Centre
Oester Volgade 10-L
Copenhagen K, DK-1350
DENMARK

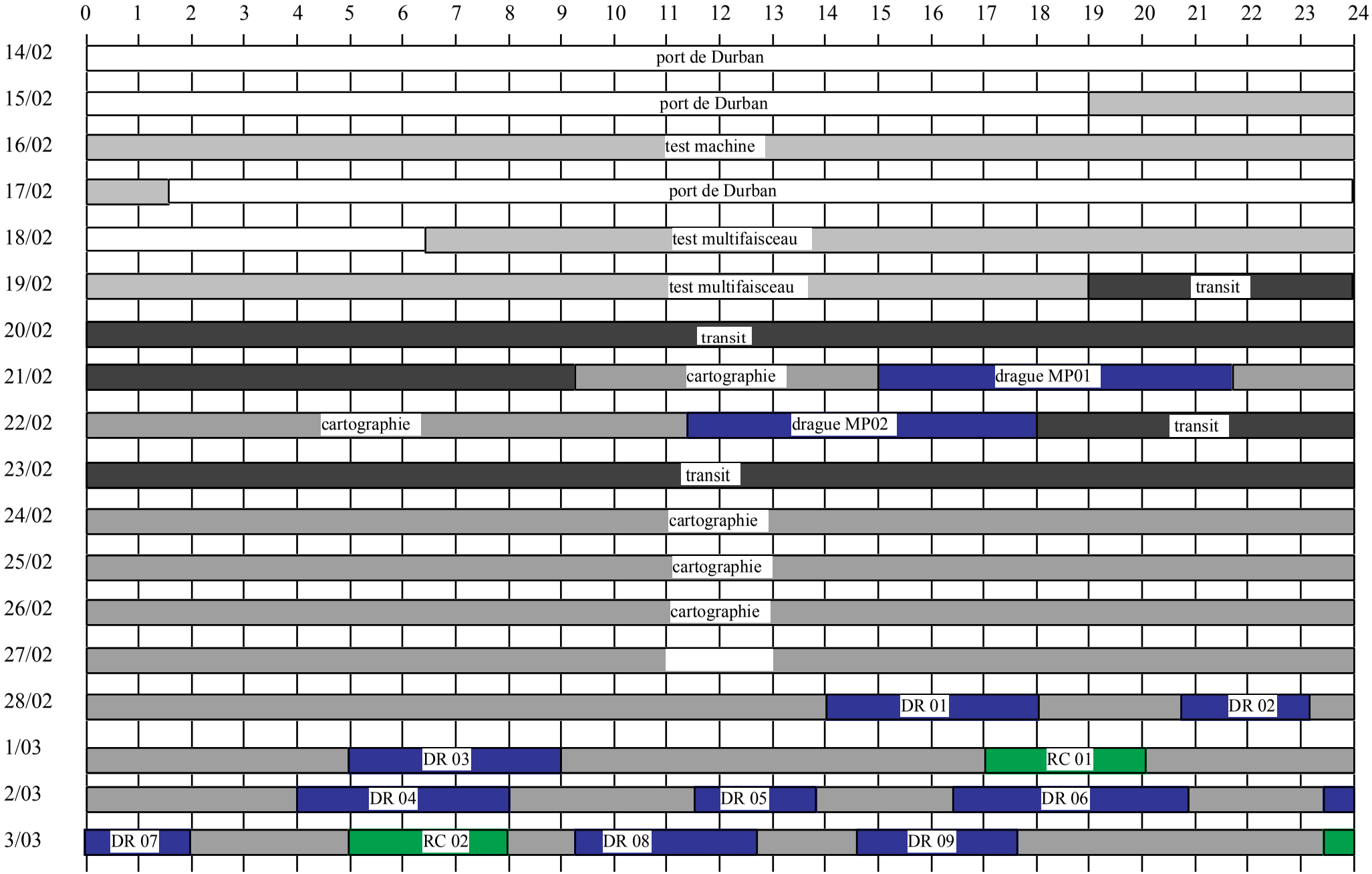
RABAIN Aline
Laboratoire de Géosciences Marines
IPGP case 89
4 placeJussieu, 75252 Paris cedex 05
tel = 33 (0)1 44 27 51 94
rabain@ipgp. jussieu.fr

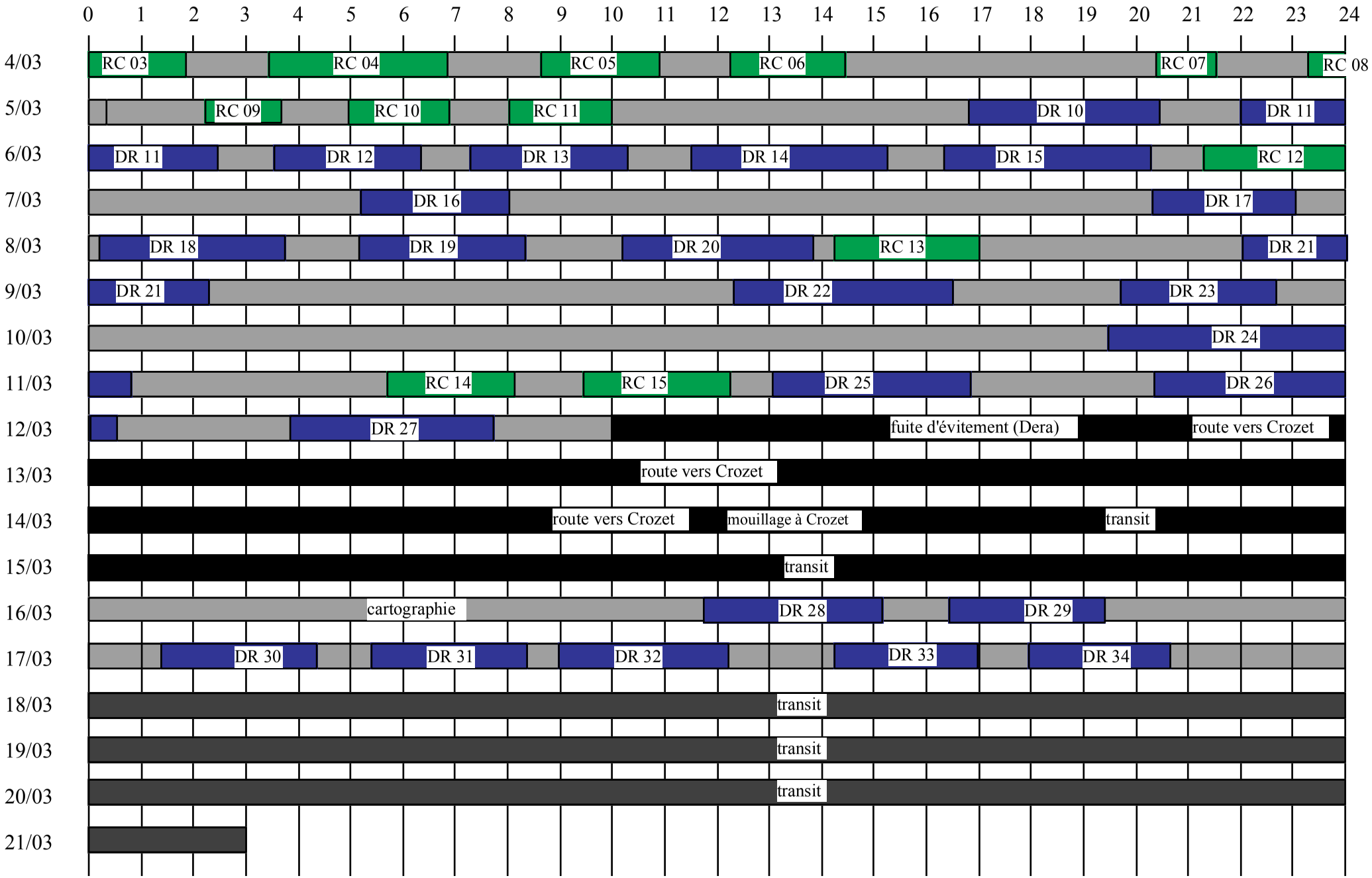
SAUTER Daniel
Institut de Physique du Globe de Strasbourg
5 rue René Descartes
67084 Strasbourg cedex
tel = 33 (0)3 90 24 01 04
fax = 33 (0)3 90 24 01 25
Daniel.Sauter@eost.u-strasbg.fr

STOREY Michael
Danish Lithosphere Centre
Oester Volgade 10-L
Copenhagen K, DK-1350
DENMARK
tel = (+45) 38 14 26 44
fax = (+45) 33 11 08 78
ms@dlc.ku.dk

WHITECHURCH Hubert (*alias Tonton Hub*)
Institut de Physique du Globe de Strasbourg
5 rue René Descartes
67084 Strasbourg cedex
tel = 33 (0)3 90 24 01 04
fax = 33 (0)3 90 24 01 25
Hubert.Whitechurch@eost.u-strasbg.fr

Calendrier des opérations (TU)

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INTRODUCTION

The distinctive isotopic signature of Mid-Ocean Ridge Basalt (MORB) in the Indian ocean relative to that in the Pacific and most of the Atlantic is now well established. The causes of this fundamental difference remain problematical. Sampling and hence geochemical information are sparse along the indian Ocean spreading centers in general, and there are immense sections for which little or no data coverage exists. For example, no sample have been dredged between Indomed Fracture Zone and 42°E (about 300 kilometers). Furthermore, among the oceanic ridges the precise morphology of the ridge axis between 30°E and 50°E is unknown. The maxima of this isotopic anomaly is located between 30° and 50° E on the Southwest Indian Ridge. It is important to outline that most of the rocks which have been analysed from this portion of the ridge are not zero age MORB but rather off axis sampling sites.

The Southwest Indian ridge extends from the Indian Ocean triple junction to the Bouvet triple junction; it has been spreading at very low rates throughout the Cenzoic and today is the slowest spreading major ridge on the Planet, with a half-rate of only 0.6 to 0.9 cm/yr. Its central part is dominated by several spectacular and numerous smaller left lateral transform faults which separate many short, roughly E-W trending spreading segments.

Our investigation of the Southwest Indian Ridge started 3 years ago with an intense sampling of the active ridge axis between 69°E and 49°E with the *Marion Dufresne* (EDUL). The SWIFT cruise is the continuity of the petrological and geochemical investigation of the ridge westward up to 50°E. This portion of the ridge axis is known to be the most extreme DUPAL signal of the global ridge system. However, the relatively poor sampling of this area does not permit to determine the "shape" of this anomaly. Is there any *organized* evolution of the basalt geochemistry like those we know around Hot Spot ? Are the step like isotopic variations bounded by fracture zones ? Is there any mantle temperature control on the isotopic domains along this portion of the southwest Indian Ridge ?

In order to get an insigth into these problems, the aims of the South West Indian French Transit (SWIFT) was devoted:

- to the mapping of the South West Indian Ridge between 30°E and 50° E,
- to the sampling of zero age basalt along this portion of the ridge axis,
- to the sampling of old basalt perpendicular to the ridge axis in order to get temporal informations about the DUPAL anomaly.

Another related topic is the interaction between the ridge axis and Madagascar Plateau. Two off axis sampling have been conducted in order to answer the question of a continental or oceanic nature of this plateau.

During this cruise we faced several important events and problems. The gravimeter did not work at all and thus the expected integrated study the ridge segmentation is incomplete. An unexpected delay for refueled the ship at Durban lasted 24 hours. The main winch of the ship was not working during 24 hours. We got stuck during the second dredge and lose about 2500 meters of wire at sea with one dredge, one Pinger and one MAPR. The second MAPR did not work properly and thus expected hydrothermal investigation of the ridge was not possible. A magnetometer was lost at sea and the second one did not work continuously. Health emergency oblige us to stop the cruise during 3 days in order to go to Crozet Island. Finally, we avoid a strorm coming from the Corridor between Madagascar and South Africa. The initial number of days to work at sea was 27 days but finally only 20 days were available.

Despite this perplexing list of troubles, we did 36 dredges and 15 rock cores rather than the 40 dredges and 20 rock cores expected. We have changed, in real time, part of our objectives in order to save a coherent scientific program. First of all, scientists on board working on ridge segmentation accepted a *ligther* program of cartography on the active ridge in order to get more time for rock sampling. Because the winch did not work between and °E we used the rock core to investigate small scale geochemical variation along this segment. This scale of investigation was not the initial purpose of our proposal. Fortunatly, successfull dredges have been done between and °E precisely located on the maxima of the DUPAL anomaly. The scientific objectives of our colleagues from the DLC (Danish Lithospheric Center) have been reached (over 5 off axis operations 4 of them recovered rocks).

PRELIMINARY RESULTS.

We did 36 dredges (5 off axis dredges and 31 on the active axis) and 15 rock cores. The total mass of rocks recovered is about 4500 kg. However after selection of the best samples the total mass of rocks sended to Paris is about 1000 kg.

The mean depth of the sampled sites is about 2784+/-526 mètres. About 94% of the dredged rocks are basalts. Locally some peridotites have been sampled (DR26, DR27 and DR24). Basalts are plagioclase porphyric and aphyric. There is no systematic relationship between the aphyric basalt (DR13, DR18, DR23, DR30, DR32) and location on the ridge. In contrast, porphyric basalts (DR12, DR19, DR20 and DR28) are mostly located in the center of the segment (excepted DR20). Some dredges are very heterogeneous with aphyric and porphyric samples (DR01, DR03, DR05, DR06, DR08, DR15, DR16). This association of petrological types are mostly present at the end of segments (excepted dredges DR03 and DR05).

Données Géophysiques : Acquisition, traitement et résultats préliminaires

I - Acquisition des Données

Gravimétrie.

Le gravimètre (Lacoste et Romberg) n'était pas en état de marche pendant la mission. La panne s'est déclarée en janvier 2001 pendant la mission OISO 6. Une carte électronique de contrôle des giroscopes était défaillante. Une carte de rechange a été commandée et livrée à Durban pendant l'arrêt technique. Une fois mise en place, cette nouvelle carte n'a cependant pas résolu le problème, dont la cause reste donc à diagnostiquer.

Magnétisme

Magnetic data were acquired since the 22/02/01 at 18:00 over the Madagascar plateau until the end of the cruise: during the geophysical survey along the ridga axis and when it was possible between the dredges.

A Geometrics G-886 marine magnetometer was first used until the 01/03/01 at 16:00 when it was lost. A Bahringer magnetometer was then used from the 04/03/01 at 15:00 until the end of the cruise. However, with this magnetometer the values of the magnetic field were oscillating very strongly around 30000 to 35000 nT which are typical values of the regional magnetic field (about 32320 nT at -42S/42E). Too low values (about 25000 nT) and too strong ones (about 40000 nT) have to be removed before calculating the magnetic anomalies. This will be done on land, taking into account the distance between ship and magnetometer (300 m), as well as the picking of the anomalies along the across-axis profiles.

Principle of the acquisition:

The magnetometers use the 'proton precession' to measure the magnetic field. The operational design is as follow. A non-magnetic container is filled with kerosene in which a coil is immersed. So long as no current is applied to the coil, protons of the kerosene will align themselves with the earth's magnetic field. However, as soon as 'polarizing' current is applied to the coil the protons will align themselves with the magnetic field of the energized coil. When the current is removed from the coil, the protons will 'turn away' from their alignement with the field of the coil to become realigned with the earth's magnetic field. As they 'turn away' the protons do not directly turn to align themselves with the earth's field, but rather 'precess' like a spinning top. As they precess, the protons behave like tiny magnets inside the sensor coil, inducing a small signal in the coil. This signal can be amplified and its frequency counted to produce an accurate measurement of the intensity of the magnetic field at the sensor. The frequency of the measured signal is proportional to the absolute value of the earth's magnetic field in which the magnetometer's sensor is operating. Thus, a proton procession magnetometer is an instrument that measures the absolute value of the

earth's magnetic field by measuring the proton precession frequency and converts that frequency into nanoteslas.

Bathymétrie et Imagerie

Le sondeur multifaisceaux TSM 5265B a permis l'acquisition de la bathymétrie et de l'imagerie. Il utilise pour son fonctionnement les informations issues de la centrale de cap et verticale (roulis, tangage, cap, vitesses du bateau) et de la centrale de navigation (latitude, longitude). Pendant la campagne, nous avons disposé de données de GPS différentiel (émissions depuis Durban).

Bathymétrie :

Le sondeur TSM 5265B, utilisé en mode grands fonds, analyse simultanément 5 faisceaux adjacents dans le sens longitudinal, perpendiculaires à l'avancée du bateau. La redondance des données ainsi obtenues supprime les trous de couverture d'un sondeur multifaiceaux classique et améliore la précision de mesure. Ces 5 faisceaux sont émis à des fréquences différentes, le système global fonctionnant à 12 kHz. La réception des signaux acoustiques du sondeur est assurée par 5 panneaux identiques, disposés de manière transverse au bateau. Cette antenne de réception est composée de 3 sous-antennes, une centrale, comportant 1 seul panneau, et deux autres à babord et tribord respectivement, avec 2 panneaux chacunes. Les sous-antennes babord et tribord font un angle de 41° par rapport au plan horizontal.

La résolution transversale sur le fond est de H/100, H étant la hauteur d'eau. Les profondeurs d'utilisation minimale et maximale sont de 100 m et 11000 m respectivement. La couverture transversale est de 12 km pour 3000 m de fond.

Imagerie :

L'imagerie traduit la plus ou moins grande réflectivité du fond, en fonction du type de lithologie et de la topographie associée. Le signal se visualise dans l'échelle des gris. Un signal très réflectif (foncé sur l'imagerie) correspondra à des affleurements de roche dure, ou à de fortes pentes. A l'inverse, les sédiments très absorbants se traduiront par des couleurs claires sur l'imagerie.

Sondeur vertical :

En plus de l'acquisition multifaisceaux, un sondeur vertical, donnait en permanence la profondeur sous le bateau. Ce sondeur fonctionnait à 3.5 kHz en transit, et à 12 kHz lors des dragues et rock cores faites sans pinger. A 12 kHz en effet, la pénétration est moindre qu'à 3.5 kHz, et donc la réflexion du fond est plus nette. Lorsque le sondeur vertical émettait à 12 kHz, fréquence moyenne du système multifaisceaux, le TSM 5265B était coupé, pour éviter toute interférence.

II - Traitement des Données

Traitement de la bathymétrie

Les données du multifaisceaux ont été traitées au fur et à mesure de leur acquisition avec le logiciel Caraibes. Nous avons utilisé une chaîne de traitement standard permettant une visualisation rapide des données sous forme de grilles (mnt) à pas de 100m. Le logiciel Caraibes n'est pas encore au point pour l'identification des sondes dites "invalides" du Thomson TMS 5265: un très grand nombre de sondes, pour la plupart bonnes, sont ainsi classées "invalides" et on ne peut donc utiliser l'option "traitement des sondes valides uniquement" des fonctions Creaxy et Mailla. Nous avons testé des chaînes de traitement comportant un très faible degré de lissage, mais celles ci ne permettaient pas d'obtenir dans tous les cas des grilles "présentables". Nous avons donc utilisé une chaîne de traitement comportant un lissage notable (filtrage des données xyz du sondeur par comparaison avec une grille spline en début de traitement, puis spline faible du mnt résultant).
Les grilles obtenues ont permis de localiser les draguages et carottages. Nous avons toujours observé une bonne concordance entre la forme générale des reliefs cibles sur la bathymétrie maillée, et les indications du sondeur 12 kHz. Les profondeurs, par contre, étaient souvent plus importantes, de l'ordre d'une centaine de mètres, sur la grille que d'après le 12 kHz. Cet écart est peut être du au fait que la profondeur donnée par le sondeur 12 kHz est déterminée sur une large zone sur le fond (env. 800m à 1 km de diamétre pour une profondeur de 3000m) car l'angle d'ouverture du cône d'émission du sondeur 12 kHz est important (env. 8-10degrés?). On ne peut cependant pas exclure que cet écart de profondeur soit lié à la vitesse de propagation dans l'eau utilisée pour le traitement initial des données Thomson TMS 5265, ou à un lissage excessif des données par le traitement Caraibes. La réalisation de grilles moins lissées pendant le traitement à terre des données de la campagne permettra en partie d'éclairer la question.

Paramètres de la chaîne de traitement Caraibes standard pour la bathymétrie:

1- Importation des données (.bat) du TMS 5265. Fonction Tm5265. Sortie: .mbb et .nvi.

décalage entre antenne sondeur et référence de navigation : 68 m devant, 3 m tribord, 6 m dessous.

2- Fabrication d'un .xy à partir des .mbb et .nvi. Fonction Creaxy. Sortie: .xy.

pas de contrôle du cap sondeur, recherche cycles dans câdre élargi, cartographie: WGS-84 et latitude échèlle de référence : 42°S.

3- Fabrication d'un .mnt à pas de 500m à partir du .xy. Fonction Mailla. Sortie: .mnt.

pas du mnt: 500m, résolution des sondes: 1/2m, cellules affectées: 1, contrôle mini (500m ou moins selon les zones), maxi (6000m ou plus selon les zones), pas de suppression des valeurs isolées, interpolation à pas de 10 lignes/colonnes.

4- Spline faible du .mnt. Fonction Spline. Sortie : .mnt.

résidu max : 100 m, interpolation des valeurs supprimées à pas de 5 lignes/colonnes.

5- Filtrage du.xy par comparaison avec le . mnt spliné. Fonction Filtxy. Sortie: .xy.

seuils de filtrage dépendant des pentes, avec contrôle sur l'écart de profondeur: de 0-5% (pente): 30m; 5-10%: 30m; 10-30%: 120m; 30-50%: 150m; 50-70%: 50m; 70-100%: 30m.

6- Fabrication d'un .mnt à pas de 50m à partir du .xy filtré. Fonction Maillp (avec moyenne pondérée). Sortie: .mnt.

pas du mnt: 50m, résolution des sondes: 1/2m, rayon d'influence d'une sonde: 100m, contrôle mini (500m ou moins selon les zones), maxi (6000m ou plus selon les zones), suppression des valeurs isolées: au moins deux sondes par point du mnt, interpolation à pas de 5 lignes/colonnes.

7- Réduction du .mnt en un mnt à pas de 100m. Fonction Invmnt. Sortie: .mnt.

réduction par moyenne au pas de 2 lignes/colonnes.

8- Spline faible du .mnt à pas de 100m. Fonction Spline. Sortie : .mnt.

résidu max : 50 m, interpolation des valeurs supprimées à pas de 4 lignes/colonnes.

Traitement de l'imagerie du Thomson TMS 5265

Les données d'imagerie obtenues pendant le passage continu sur l'axe en début de mission ont été traitées au fur et à mesure de leur acquisition avec le logiciel Caraibes. Les données obtenues ultérieurement pendant les transits entre dragues n'ont pas été traitées à bord. La chaîne de traitement utilisée est simple et permet une bonne visualisation des données.

Paramètres de la chaîne de traitement Caraibes standard pour l'imagerie:

1- Importation des données (.ima) du TMS 5265 et mixage avec la navigation (.nvi). Fonction ImT5265. Sortie: .imo.

traitement de toutes les fréquences, taille du pixel: 25 m, décalage entre antenne sondeur et référence de navigation : 68 m devant, 3 m tribord.

2- Filtrage du .imo. Fonction Efiltr. Sortie: .imo.

lissage par moyenne, taille de la fenêtre de traitement: 2X/2Y.

3- Interpolation du .imo. Fonction Efiltr. Sortie: .imo.

moyenne des voisins proches, interpolation du point central, taille de la fenêtre de traitement: 2X/2Y.

III - Contexte Géophysique de la zone d'étude

La zone d'étude est située entre 32° et 50° de longitude Est sur la dorsale Sud Ouest Indienne (figure 1). Le début de la mission a par ailleurs concerné le bord Ouest du Plateau de Madagascar.

Le taux d'expansion le long de la dorsale Sud Ouest Indienne pour les derniers 20 Ma est très lent : ~ 1.6cm/an (Patriat et al., 1997). La direction d'expansion dans la zone d'étude est N10-13°, et la direction régionale de l'axe de la dorsale est ~ N55, ce qui correspond à une obliquité importante avec la direction d'expansion. Cette obliquité est en grande partie accommodée par 7 failles

transformantes (Andrew Bain, Marion, Prince Edward, Eric Simpson, Discovery 2, Discovery 1, et Indomed; Figure 1), de décalage compris entre 80 km (Eric Simpson) et 520 km (Andrew Bain).
Les données topographiques existantes pour cette région de la dorsale avant la campagne SWIFT (Fisher and Goodwillie, 1997, compilation de données monofaisceaux, et Sandwell et al. 199, bathymétrie prédite d'après les données d'altimétrie satellitaire) montraient déjà que la zone d'étude est la région la moins profonde de la dorsale Sud Ouest Indienne.
La profondeur régionale de l'axe d'une dorsale peut être interprétée en termes d'épaisseur de la croûte, et de température et de taux de fusion du manteau. On peut ainsi prédire que la zone d'étude est une région à croûte relativement épaisse (en moyenne), bien alimentée en magma par le manteau sous-jacent. Un calcul simple fondé sur un équilibre isostatique (Cannat et al., 1999) conduit à proposer une différence d'épaisseur de la croûte de l'ordre de 4 km entre la région la plus profonde de la dorsale Sud Ouest Indienne (62°E-68°E) et la région la moins profonde (34°E-52°E). Ceci est en accord avec les anomalies de Bouguer réduites au manteau (MBA ou Mantle Bouguer Anomaly) calculées à partir de l'anomalie à l'air libre satellitaire et de la bathymétrie GEBCO (Georgen et al., sous presse). Il existe en effet une anomalie négative marquée de la MBA entre les zones de fracture de Prince Edward (35˚E) et de Gallieni (52˚E). La MBA le long de l'axe augmente d'environ 160mGal entre cette région peu profonde de l'axe, et les zones proches du point triple de Rodrigues. Hors axe, le minimum de MBA suit l'alignement des îles Marion et Crozet au Sud. Au Nord, ce minimum de MBA rejoint la trace du point chaud de Marion jusqu'au plateau de Madagascar, telle qu'elle a été reconstituée par Duncan and Richard (1991).
Georgen et al. (sous presse) proposent que ces MBA très négatives et les faibles profondeurs de l'axe dans la zone d'étude résultent de l'influence du point chaud de Marion sur la dorsale. Des études cinématiques et géochimiques ont permis de retracer l'histoire de ce point chaud. Selon Storey et al. (1995) le rifting entre Madagascar et l'Inde s'est accompagné de la mise en place d'énormes volumes de roche magmatiques vers 88 Ma. Les reconstructions cinématiques attribuent ce magmatisme à l'activité du point chaud de Marion, qui, suite à l'ouverture de la dorsale sud-ouest Indienne, aurait ensuite dérivé vers le sud (Duncan , 1990 ; Dyment, 1991 ; Müller et al., 1993 ; Storey et al., 1995).

Le plateau de Madagascar, vaste structure allongée d'environ 1200 kilomètres suivant une direction générale sud-sud-ouest, au sud de l'île de Madagascar, pourrait représenter la trace Crétacé-Tertiaire du point chaud de Marion (Duncan, 1990; Storey et al; 1995). On peut noter qu'une structure linéaire prolonge ce plateau vers le Sud jusqu'au contact avec la dorsale Sud Ouest Indienne à 39°E-42°E, au voisinage de la zone de fracture Discovery II. La carte de l'anomalie de Bouguer réduite au manteau montre que tout cet ensemble est caractérisé par des anomalies négatives (donc de fortes épaisseurs crustales), dans le prolongement de la localisation actuelle deu point chaud de Marion (île de Marion). Cependant Sinha et al (1981) font de ce plateau soit une gigantesque zone de fracture associé à un volcanisme important, soit un morceau de socle continental. Les quelques données géophysiques existantes ne permettent pas de trancher entre ces différentes hypothèses. L'épaisseur

crustale déterminée par la sismique est de l'ordre de 20-25 kilomètres (Goslin et al; 1980, 1981; Sinha et al; 1981). Le seul dragage, effectué en 1968 (R/V Argo) à 26°28,5 S et 46° 07 E sur un pic topographique à proximité de la zone de fracture majeure du plateau, a permis de prélever des basaltes alcalins porphyriques. En dehors de cela, la nature de ce plateau n'est absolument pas contrainte.

IV - Analyse préliminaire des données bathymétriques.

L'axe de la dorsale Sud Ouest Indienne.

A cause de la réduction du temps de mission, nous n'avons pu faire qu'un passage le long de l'axe, au lieu des deux prévus. Ce passage unique a été complété par endroit, à la faveur des transits entre dragues, et des transits de et vers Crozet (pour rapatriement sanitaire). La figure 2 montre l'ensemble des données obtenues entre la zone de fracture Prince Edward et 49°E. Le draguage des deux segments de dorsale situés entre Andrew Bain et Prince Edward (figure 1) a en outre permis de compléter la carte levée par Grindlay et al. (données non publiées).

L'axe est clairement segmenté, avec des portions peu profondes au centre des segments et des portions plus profondes aux extrémités, comme dans le schéma classique des dorsales lentes. Les failles transformantes Eric Simpson, Discovery 1 et 2, et Indomed ont été partiellement ou totalement cartographiées. La carte (Figure 2) montre en particulier que les vallées transformantes de Eric Simpson et d'Indomed contiennent d'impressionantes rides médianes. Nous avons également cartographié le sommet des murs Ouest des zones de fracture Discovery 1 et 2, dans le double objectif d'identifier d'éventuelles surface "corruguées", et d'obtenir des profils magnétiques hors axe. Les grilles réalisées pendant la mission sont trop lissées pour déceler des corrugations, et nous n'avons pas traité les données magnétiques à bord. L'apport de ces profils ne pourra donc être évalué qu'après études à terre.

Outre les vraies failles transformantes, plusieurs discontinuités "non-transformantes" permettent d'accommoder l'obliquité entre la direction régionale de l'axe (~N55), et la direction d'expansion (~N13). Ces discontinuités non transformantes sont marquées par des dépressions obliques, et font jusqu'à 120 km de long (distance mesurée le long de l'axe). Les rides volcaniques présentes dans les portions centrales des segments s'incurvent puis disparaissent dans ces dépressions. Les dimensions, la morphologie de ces discontinuités non transformantes, et leurs relations avec les portions centrales des segments, sont tout à fait comparables à ce qui a été décrit pour les régions plus orientales de l'axe de la dorsale Sud Ouest Indienne (Mendel et al., 1997). Ces caractéristiques sont probablement spécifiques aux dorsales ultra-lentes.

Nous avons très précisemment pointé l'axe de la dorsale en utilisant les grilles bathymétriques à pas de 100 m, et les cartes de réflectivité. Nous avons utilisé les mêmes conventions que pour l'étude de la partie orientale de la dorsale (voir Cannat et al., 1999): pointer les rides volcaniques lorsqu'elles existent, le fond de la vallée axiale lorsqu'il n'y a pas de ride, et le fond des bassins dans les discontinuités non transformantes. L'axe ainsi pointé n'a guère de signification tectonique (la déformation est en effet certainement distribuée dans toute la vallée axiale), mais représente sans doute assez bien la localisation du volcanisme axial le plus abondant. Nous avons également repéré sur toute la zone d'étude la position du point le plus profond de l'axe. La comparaison des deux profils de profondeur résultant (Figure 3) permet de repérer l'existence et la hauteur des rides volcaniques axiales.

La figure 4 montre la variation de la profondeur et de l'anomalie à l'air libre satellitaire (Sandwell et al., 1995) le long de l'axe dans la zone d'étude. Les profondeurs prédites à partir des données satellitaires sont également représentées pour comparaison avec les profondeurs mesurées. Les valeurs moyennes de la profondeur de l'axe varient et amènent à distinguer 3 régions:

- une région (~680km en distance le long de l'axe, vallées transformantes comprises) assez peu profonde entre Prince Edward et Discovery 2 FZ (profondeur moyenne hors vallées des failles transformantes Eric Simpson et Discovery 2: 3050 m);
- une région (~850km en distance le long de l'axe, vallées transformantes comprises) plus profonde entre Discovery 1 FZ et ~ 49°50'E (profondeur moyenne hors vallées des failles transformantes Discovery 2 et Indomed : 3530 m);
- et une région courte (~250 km), entre ~49°50'E et Gallieni FZ (profondeur moyenne hors vallée transformante de Gallieni : 3090 m);

Ces différences de profondeur régionale de l'axe peuvent être interprétées en termes de différences d'épaisseur crustale, si l'on suppose (et cela est probablement justifié au moins pour les deux régions les plus longues) qu'un équilibre isostatique est atteint à l'échelle régionale. La profondeur moyenne (3530 m) de l'axe entre Discovery 1 FZ et ~ 49°50'E est typique de l'axe de la dorsale Médio-Atlantique hors zone d'influence des points chauds et peut donc être choisie comme profondeur de référence pour une croûte d'épaisseur normale. Le modèle de fusion du manteau, refroidissement conductif et équilibre isostatique proposé pour la partie orientale de la dorsale Sud Ouest Indienne par Cannat et al. (1999) associe cette profondeur de référence à une épaisseur de croûte moyenne de 5.5 km et à une température du manteau au solidus de 1340°C. En utilisant ces valeurs de référence et les profondeurs moyennes mesurées, ce modèle suggère pour les régions moins profondes de l'axe dans la zone SWIFT, des épaisseurs de croûte de l'ordre de 6.8 km pour des températures du manteau au solidus de l'ordre de 20-30° supérieures à la température de référence. On peut noter que les valeurs moyennes de la FAA sont à peu près les mêmes dans toute la zone d'étude, sauf à l'Ouest de Prince Edward FZ. Ceci suggère bien que les profondeurs plus grandes entre Discovery 1 FZ et ~ 49°50'E sont associées à une croûte océanique plus mince que dans le reste de la zone d'étude.

Les variations de profondeur de l'axe à plus petite échelle sont liées à la segmentation. La figure 3 montre le schéma de segmentation adopté à l'issue de la campagne, et utilisé pour la description des points de draguage et de carottage. Les centres des segments sont les points les plus hauts de l'axe. Les extrémités sont les points les plus profonds, hors vallées transformantes. La forme des segments en carte est en général sigmoïde: la partie haute centrale est orientée perpendiculairement au mouvement des plaques, et les extrémités, plus profondes, sont orientées ENE ou NE. Les segments 4, 6, 9 et 12 comprennent 3 petits hauts distincts (a, b et c) qui correspondent à des rides volcaniques. Le segment 15 est une ride volcanique incluse dans la longue discontinuité non transformante de 48°E. On note un changement du style de la segmentation entre la région moins profonde de la zone d'étude (Prince Edward à Discovery 2), et la région orientale plus profonde. Dans la région moins profonde, les segments sont longs (plus de 90 km en distance le long de l'axe) et hauts (de 1240 à 3060 m). Dans la région plus profonde, on voit apparaître des segments courts (moins de 40 km) et à faible relief (moins de 1000m), qui correspondent à des rides volcaniques isolées dans la vallée axiale.

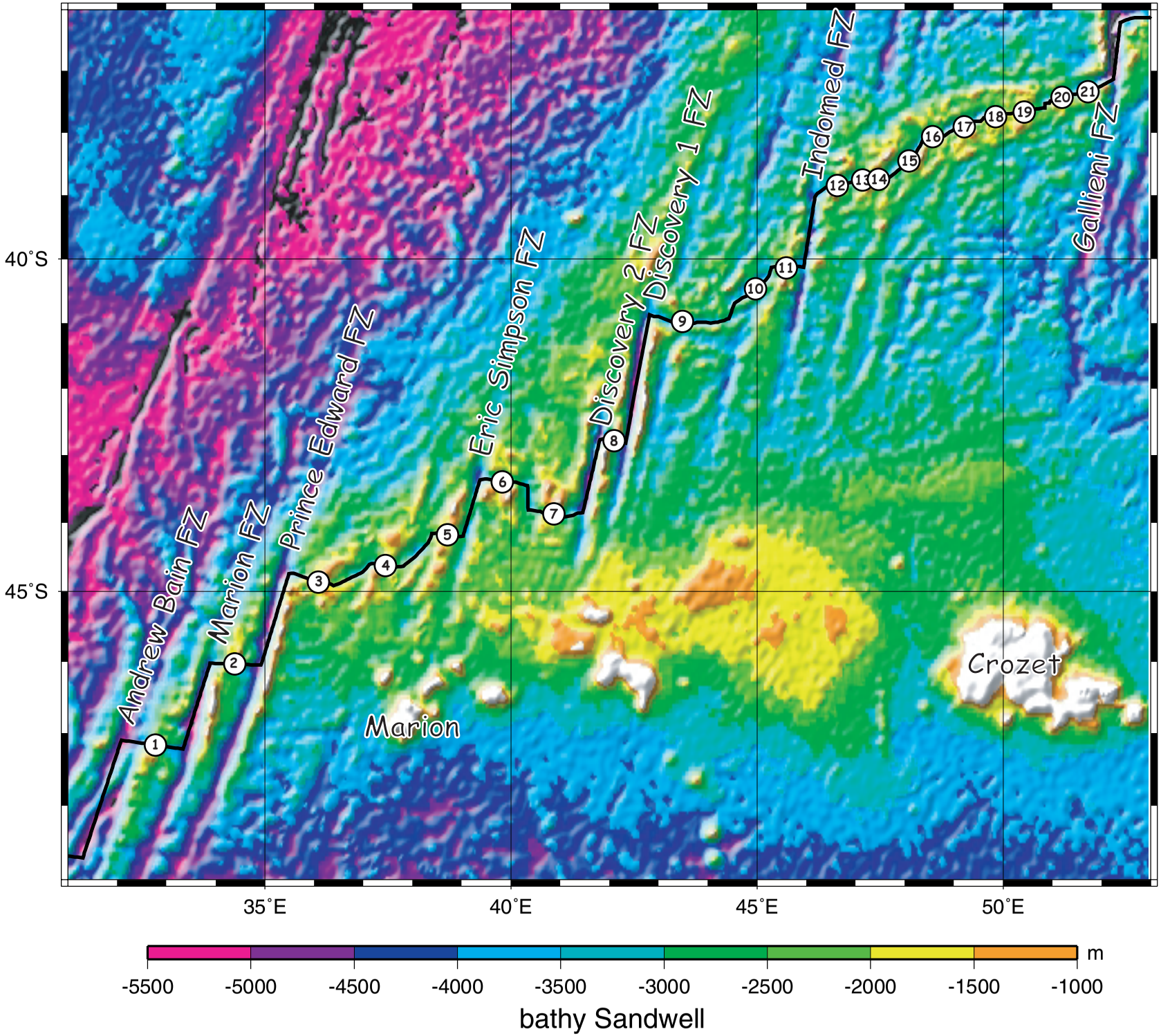
Les profils de profondeur et de FAA en fonction de la distance le long de l'axe (Figure 3b et c) permettent de se faire une idée plus précise de la longueur des segments, et de la morphologie interne des vallées transformantes. On voit ainsi nettement les rides médianes de vallées transformantes de Eric Simpson et Indomed FZ. On peut aussi sur cette figure apprécier la longueur des failles transformantes, et des discontinuités dites "non-transformantes". La discontinuité non transformante de 44°E, dans laquelle ont été draguées des péridotites serpentinisées, fait près de 120 km de long.

Le Plateau de Madagascar

Nous avons cartographié très partiellement le rebord Ouest du Plateau de Madagascar pour localiser les sites des dragues MP01 et MP02. Lors du transit vers l'axe de la dorsale, nous avons levé un profil sur le bord SE du Plateau, et sur sa transition avec la croûte océanique formée à l'axe de la dorsale Sud Ouest Indienne. Ces données seront dépouillées et exploitées à terre.

Les transits (de Durban, vers et de Crozet, vers la Réunion).

Nous avons effectué des levers bathymétriques et magnétiques lors de tous les transits, en adaptant un peu les routes lorsque cela était possible pour compléter la couverture hors axe de la dorsale et la couverture de la trace du point triple. Les routes de tous ces transits sont montrées en figure 5. Ces données seront dépouillées et exploitées à terre.


Andrew Bain FZ
Marion FZ
Prince Edward FZ
Eric Simpson FZ
Discovery 2 FZ
Discovery 1 FZ
Indomed FZ
Gallieni FZ
Marion
Crozet
40˚S
45˚S
35˚E
40˚E
45˚E
50˚E
-5500
-5000
-4500
-4000
-3500
-3000
-2500
-2000
-1500
-1000
m
bathy Sandwell

Echelle : 1/2208737 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR

B11_02

CNRS/Paris6
Par : rabain

Le 16/03/2001
a 13:01:31

Logiciel CARAIBES
(c) IFREMER

Fichier : B11_02_500.mnt
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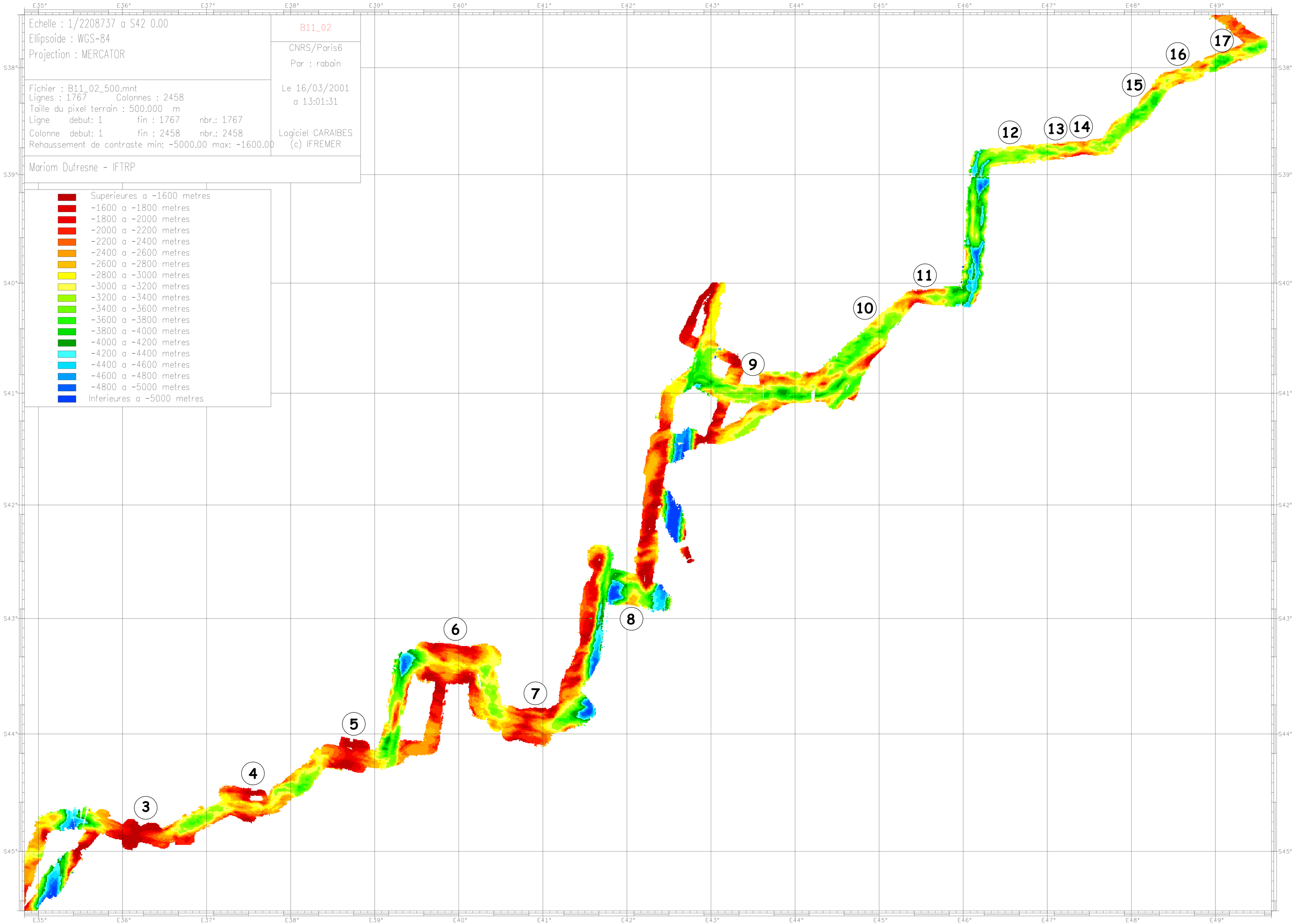
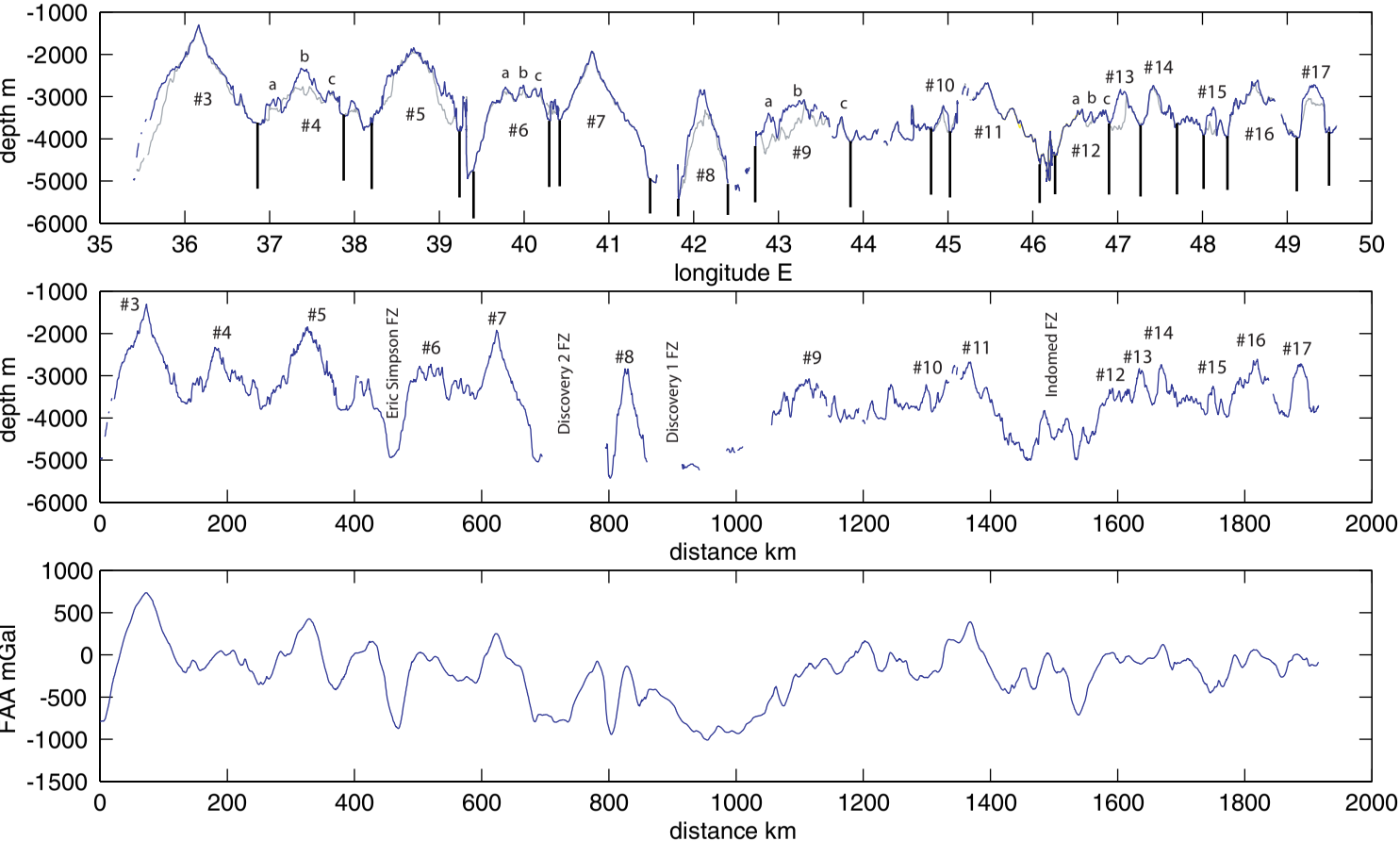
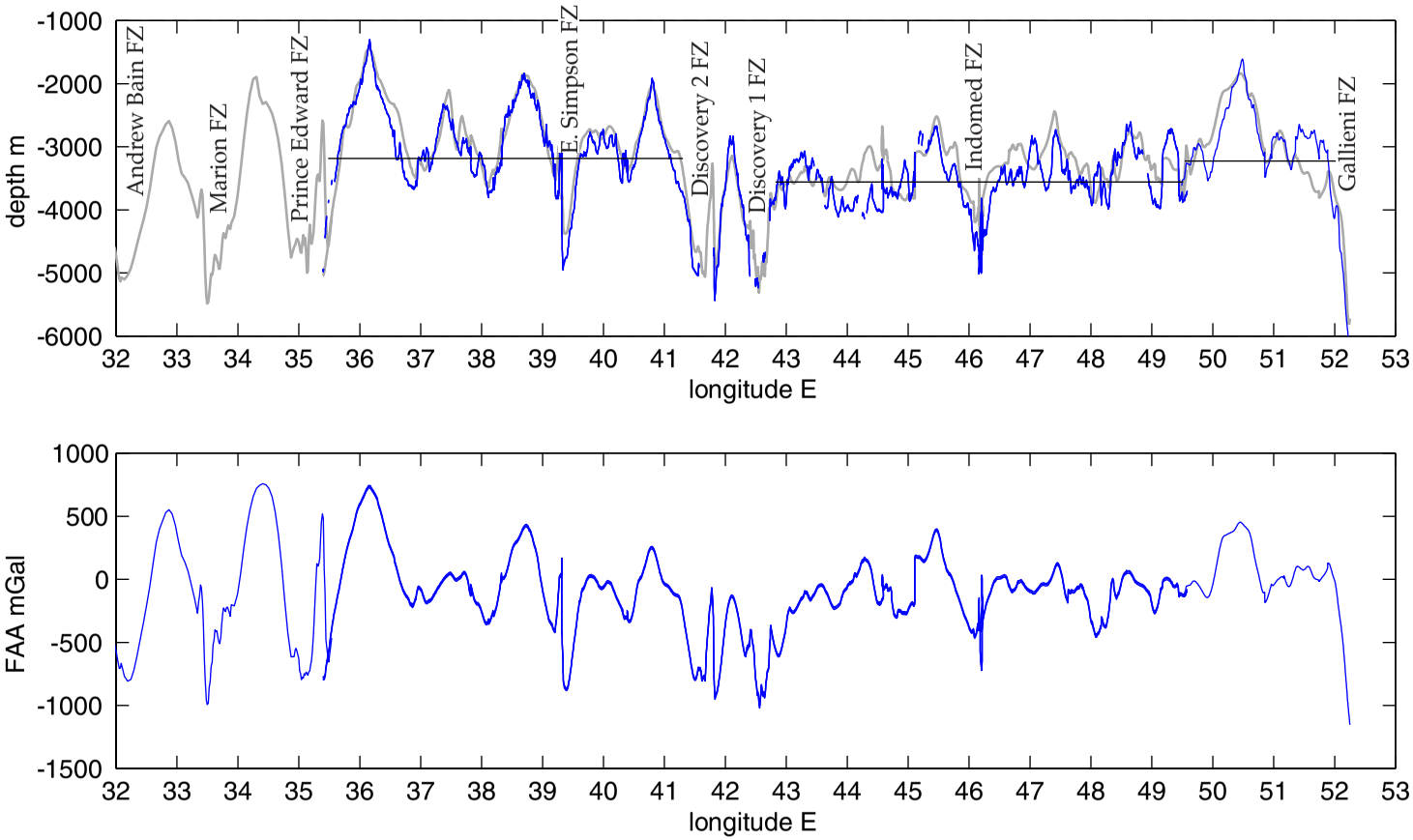
Taille du pixel terrain : 500.000 m
Ligne debut: 1 fin : 1767 nbr.: 1767
Colonne debut: 1 fin : 2458 nbr.: 2458
Rehaussement de contraste min: -5000.00 max: -1600.00

Mariom Dufresne - IFTRP

- Superieures a -1600 metres
- -1600 a -1800 metres
- -1800 a -2000 metres
- -2000 a -2200 metres
- -2200 a -2400 metres
- -2400 a -2600 metres
- -2600 a -2800 metres
- -2800 a -3000 metres
- -3000 a -3200 metres
- -3200 a -3400 metres
- -3400 a -3600 metres
- -3600 a -3800 metres
- -3800 a -4000 metres
- -4000 a -4200 metres
- -4200 a -4400 metres
- -4400 a -4600 metres
- -4600 a -4800 metres
- -4800 a -5000 metres
- Inferieures a -5000 metres




depth m
longitude E
#3
#4
#5
#6
#7
#8
#9
#10
#11
#12
#13
#14
#15
#16
#17
a
b
c
Eric Simpson FZ
Discovery 2 FZ
Discovery 1 FZ
Indomed FZ
distance km
FAA mGal


Andrew Bain FZ
Marion FZ
Prince Edward FZ
E. Simpson FZ
Discovery 2 FZ
Discovery 1 FZ
Indomed FZ
Gallieni FZ
depth m
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-2000
-3000
-4000
-5000
-6000
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longitude E
FAA mGal
1000
500
0
-500
-1000
-1500
32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53
longitude E

SWIFT DR MP 01

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/02/21	43°01.40'E	30°52.40'S	2600
End	2001/02/21	43°03.00'E	30°51.60'S	2150

Photo SWIFT DR __ MP01dredge.jpg, MP01/1/1.jpg, MP01/1/2.jpg, MP01/1/3.jpg, MP01/1/4.jpg, MP01/1/5.jpg, MP01/2/1.jpg, MP01/3/1.jpg, MP01/3/2.jpg, MP01/3/3.jpg, MP01/3/4.jpg, MP01/3/5.jpg, MP01/3/6.jpg, MP01/3/7.jpg, MP01/3/8.jpg, MP01/3/9.jpg

Site description: Escarpment on the western flank of the central-south Madagascar Plateau

MAPR: no

Dredge (weight and rocks):

800 kg of carbonate sediment and 5kg of altered, plagioclase-phyric pillow basalt s

Rock type:

Type 1 : WhiteYellow to light brown coloured carbonate sediment with some organic matter (wood fragments?). Some blocks have a distinct smell of sulfur. Many blocks have a thin (< 2 mm) Mn coating. Type 1 makes up about 50% of the dredge. About 15 kg was kept.

Type 2 : Cream coloured carbonate sediment. Some blocks more dense than samples from Type 1. Type 2 makes up about half of the dredge. About 15 kg was kept.

Type 3 : Fragments of altered, plagioclase phyric, fine grained pillow basalts. They occur as decimeter-sized fractured blocks with thin (~1 mm) manganese coating . One block shows chilled pillow margin consisting of altered glass. The basalt matrix ranges in colour from red-brown (hematite stained) to medium grey. The basalts are plagioclase phyric with c. 5% plagioclase crystals up to 5 mm in length. Small amounts (<1%) of clinopyroxene phenocrysts (1 mm) are also likely present.

Samples:

MP 01-1-1 : Yellow to light brown block of carbonate sediment with some organic matter (wood?). No manganese coating. Size : 7x15x17 cm. About 1 kg.
MP 01-1-2: Yellow to light brown block of carbonate sediment with organic matter (wood?). Thin (< 2 mm) manganese coating. Size : 10x15x20 cm. About 1 kg.
MP 01-1-3 : Small block of carbonte sediment with thin manganese.
Size : 2x4x5 cm. Less than 50 g.
MP 01-1-4: Small block of carbonate sediment with thin manganese coating on two sides. Size : 3x5x5 cm. About 50 g.
MP 01-1-5: Small block of carbonate sediment with thin manganese coating. Size : 4x4x9 cm. About 50-100 g.
MP 01-2-1: Cream-coloured block of carbonate . Size : 8x15x18 cm. About 800 g.
MP 01-3-1: Plagioclase-phyric pillow basalt. The sample has a thin (~1 mm) manganese coating, and , on one side, a ~7 mm thick altered glassy margin. The sample is plagioclase phyric (5%). The plagioclase phenocrysts are euhedral and 2-5 mm in length. The ground mass is fine grained and dark-brown to red-brown in colour. The sample has numerous smectite filled fractures. Size : 8x8x10 cm. About 500 g.
MP 01-3-2: Plagioclase-phyric pillow basalt. The sample has a thin (~1 mm) manganese coating.The sample contains euhedral plagioclase phenocrysts (5%) between 2-5 mm in length. The ground mass is fine grained and red-brown in colour. The sample has numerous smectite filled fractures. Size : 6x6x12 cm. About 300 gr.
MP 01-3-3 : Block of plagioclase-phyric basalt, with a thin (~1 mm) manganese coating. The sample contains euhedral plagioclase phenocrysts (5%) between 2-5 mm in length and a few are as large as 5x10 mm. Vesicles ~1-3mm in diameter. The sample has numerous smectite filled fractures. Size : 8x8x12 cm. About 1 kg.
MP 01-3-4 : Plagioclase-phyric basalt. Thin coating of manganese. Plagioclase phenocrysts are 2-5 mm and few are over 5 mm, mostly euhedral. The ground mass is fine grained and medium to light grey in colour.Thin (1mm) smectite filled fractures. Size : 10x15x15 cm. About 5 kg.
MP 01-3-5 : Plagioclase-phyric basalt. Phenocrysts are 1-3 mm, mostly euhedral and some my be altered. Fresh cut surface is dark brown to red brown as signs of alteration. May show chilled margins. Lots of fractures with altertion. Size : 4x5x10 cm. 200-300 g.
MP 01-3-6 : Plagioclase-phyric basalt. Thin manganese coating. Plagioclase phenocrysts (5% of rock) are 2-5 mm in length. The ground mass is fine grained. The sample has a grey interior and red-brown (oxidized) rim.
MP 01-3-7 : Plagioclase-phyric, fine-grained, basalt.

MP 01-3-8 : Plagioclase-phyric, fine-grained, basalt.
MP 01-3-9 : Plagioclase-phyric, fine-grained, basalt. The sample has a grey interior and red-brown (oxidized) rim.

Bags:
Type 1 = 1
Type 2 = 1
Type 3 = 1

SWIFT DR01

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/02/28	32°33,00'	47°08.0'	3850 m
End	2001/02/28	32°25'	47°07.7'	3625 m

Photos: DR01-2.JPG; DR01-1-1.JPG ; DR1-1-1.JPG; DR1-1-6.JPG

Site description: Dredge on the western flank of the ridge high of segment 1.

MAPR: yes

Dredge :

Content (weight and rocks):
400 kg, mostly pillow basalts, plagioclase phyric and aphyric types, oxidized sufaces. These basalts are not fresh but some pieces have small glassy rims. Mn crust on pillows.
Glassy margins. Sediment in the tube.

Rock type :

Type 1 : 70%
5 large pillow lavas, one being about 0.8m in diameter, glassy margins a few mm thick – with Mn coating in many places.
- 25% plagioclase phenocrysts, 0.3 cm to 1.5 cm in size
- scarce (>>1%) olivine phenocrysts, up to 1 mm
no vesicles.

Type 2 : 30%
Aphyric pillow basalts (with minor plagioclase and olivine phenocrysts).

Type 3 :
Small pillow pieces with glassy rims – both aphyric and plagioclase phyric types are included here.

Type 4 :
Bag of sediment (white to yellow) with some small pieces of manganese. Colour# 12.

Sample description :

Type 1 :

DR01-1-1: pillow; 40 cm radius, glassy margin 3 mm thick, with a thin coating of Mn crust <0.1 mm. Rare vesicles. Plagioclase phenocrysts 2-10 mm, resorbed, about 30% crystals.
1 glass bag, 2 slabs. Altered glass about 300 g (DR01-1-1 g).
DR01-1-2: pillow; 20 cm radius, glassy margin 2 mm thick, with a thin coating of Mn crust <0.1 mm. No vesicles. Plagioclase phenocrysts 2-10 mm, resorbed, about 30% crystals. Radiating joint pattern.
No glass sampled.
DR01-1-3: pillow; 20cm radius, glassy margin 1 mm thick, no Mn crust. No vesicles. Plagioclase phenocrysts 2-10 mm, resorbed, about 20% crystals.
No glass sampled.
DR01-1-4: pillow piece; 15 cm across, glassy margin 2 mm thick, no Mn crust. No vesicles. Plagioclase phenocrysts 2-5 mm, about 15% crystals.
No glass sampled, one side of sample with saw cut.
DR01-1-5: pillow; 10 cm radius, glassy margin 1 mm thick, with a thin coating of Mn crust <0.5 mm. No vesicles. Plagioclase phenocrysts 1-10 mm, about 5% crystals concentrated towards pillow margin.
In same bag as DR01-1-4.
DR01-1-6: small pillow; 5 cm radius, glassy margin 2 mm thick, thin Mn coating. Small vesicles <0.5 mm towards centre. Plagioclase phenocrysts 2-5 mm, about 2% crystals.
Altered glass about 5 g (DR01-1-6 g).
DR01-1-7: pillow; 40 cm radius, glassy margin 1 mm thick, thin Mn coating. Small vesicles <0.5 mm towards centre. Plagioclase phenocrysts 1-3 mm.
No glass sampled.

Type 2 :

Unsampled according to the fact that they do not have any glassy rim.

Type 3 :

About 500 g of altered glass.

DR01-3-1 g : About 15g of very thin pieces of glass of about 0.5 mm.
DR01-3-2 g : < 10 g with some pieces of about 0.5 mm (not fresh).
DR 01-3-4 g : Mixed glass and plagioclase crystals about 10 g.
DR 01-3-2 g : About 10 g, some pieces up to 1 cm (not fresh).
DR 01-3-5 g : About 15 g of altered glass with size up to 2.5 cm.
DR 01-1-6 g : About 20 g with size up to 1.5 cm (not fresh).
DR01-3-7 g : About 10g of mixed glass with plagiocalse. Large chunks.
DR01-3-9g : About 80 g of altered glass. Pieces with size up to 2 cm.

Type 4 :

One bag of sediment.

SWIFT DR 03

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	01/03/01	32°50.60' E	47°10.00' S	2300
End	01/03/01	32°50.50' E	47°09.60' S	2250

Photos DR 03-2.JPG; DR03-1-1.JPG ; DR3-1-2.JPG ; DR3-1-4.JPG.

Site description: Volcano (conical structure) in the center of segment 1.

MAPR: no.

Dredge (weight and rocks)

About 100 kg of basalt with porphyric, aphyric and glassy margins. Everything was kept. No sediment. About 450 g of glass extracted from different pillows from the dredge (but only 40 g really fresh).

Rock Types :

Type 1 : Plagioclase-rich porphyritic basalt with remnant of a glassy rim, a little manganese oxide, and evidence for oxidation (rusty colors). Type 1 makes up about 50kg (two large pillow fragments and a few smaller blocks).

Type 2 : Aphyric or sparsely phyric basalts, with no, or hardly any, glassy crust left. No Mn crust either. Some plagioclase and olivine phenocrysts (up to 2mm). Presumably rubble. Type 2 makes up about 10 kg in blocks of up to 1kg.

Type 3 : Many small pieces of glass-rich basalt, no manganese crust, phenocrysts are rare. Some pieces contain vesicles up to 10 mm. About 40 kg.

Samples Description :

Type 1 :

DR 03-1-1 : described as a pillow 20 cm in radius (30/20/30 cm). Porphyric basalt with plagioclase phenocrysts (10 mm), about 20% in abundance. Presence of olivine (1 to 2 mm). 5 mm thick glassy rim with Mn coating. Glass sample and 2 slabs cut. Occurrence of irregular vesicles.
DR 03-1-1 g (about 30 g) plagioclase rich with some fresh glass.
DR 03-1-2 : Pillow fragment, 15/15/10 cm, glassy rim 3mm, Mn coating on most surfaces, occasional vesicles (1 cm). Plagioclase phenocrysts 1-10 mm, partly resorbed, up to 30% of rock.
glass sample and 2 slabs.
DR 03-1-2 g : About 25 g of large pieces of glass (not really glassy).
DR 03-1-3 : Pillow fragment 10/7/5 cm, with glassy rim. Plagioclase phenocrysts up to 1 cm. Thin MnO + iron oxide coating.
DR03-1-3 g : About 30 g of mixed glass with plagioclase (no real glass but mostly fine grained basalt).
glass sample.
DR 03-1-4 : Elongated pillow 20 cm in radius, 40 cm long. Would fit the description entered for DR03-1-1 better than actual DR03-1-1! Plagioclase phenocrysts are irregular up to 1 cm. Thin MnO + iron oxide coating.
DR 03-1-4 g : Not glassy with Mn and oxide.
Glass sample and 2 slabs.
DR 03-2-1 : Pillow, 20 cm in radius. Thin glass rim (1 mm), minor MnO coating on glass. No vesicles, phenocrysts of plag and ol about 50-50%, 0.2 to 5 mm in size, make up to 5% of the rock.
2 slabs, no glass taken.

Glass samples :

DR03-3-44g :<5 g. Fresh glass, 1 piece very shiny.
DR03-3-43g : 5 g. Very fresh glass, some pieces are about .5cm.
DR03-3-42g : 2 g. Some glass with altered glass.
DR03-3-41g : ~10 g. Fresh glass with some pieces of about 1cm. Other are very thin <1mm.
DR03-3-40g : ~3 g. Fresh glass with concoidal shapes.
DR03-3-48g : ~3 g. Some pieces are nice and other altered.
DR03-3-46g : ~3 g. Fresh glass but very thin.
DR03-3-47g : ~5 g. Fresh glass but very thin.
DR03-3-45g : ~5 g. Fresh glass 3-4mm.
DR03-3-5g : ~1 g. Glass of a median quality.
DR03-3-4g : ~2g. Glass of a median quality.

SWIFT DR 04

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/02	35°46.9'E	44°44,00S	2750
End	2001/03/02	35°47.5'E	44°44.5S	2520

Photos : DR04.JPG ; DR04b.JPG ; DR04c.JPG ; DR4d.JPG ; DR4-1-2.JPG.

Site description: Small volcano at the west end of segment 3.

MAPR: No.

Dredge (weight and rocks)

About 300 kg of pillow basalts. Sediment.
Tube : Glass Station **:**One bag of pieces of glass with Mn coating.
Sediment : Presence of sediment. Color chart n°16. Abundant biological activity.

Rock Types :

The total glass extracted is about 1.5 kg. However, the glass is rarely.

Type 1 : Pillow basalt, slightly plagioclase phyric with 2-5 mm of a glassy rim. Strong Mn coating. Five samples have been selected.

Type 2 : Small pillows with fresh glasses. Vesicles can be abundant and variable from one sample to another. 14 samples have been selected and numbered for glass (from DR04-2-1 to DR4-2-14). Slabs and the rest of the rocks have been bagged and numbered :
Bag 12A : DR04-2-4, 2-11, 2-6, 2-8.
Bag 13A : DR04-2-9, 2-7, 2-4, 2-10, 2-13.
Bag 14A : DR04-2-5, 2-14.
Bag 15A : DR04-2-14 and 2-1.

Type 3 : Many small pieces of glass-rich basalt, no manganese crust, phenocrysts are rare. Some pieces contain vesicles up to 10 mm. About 40 kg.

Samples Description :

DR 04-1-1 : described as a pillow 10 cm in radius and about 40 cm long. Glassy rim of 2-3 mm. Mn coating of 0.1 mm covering the plagioclase phyric type. Some plagioclase crystals are partially resorbed. Few olivine phenocrysts are present. Vesicles of about 0.1 mm.
DR04-1-1 g : glass extracted from the pillow > 300 g. Altered glass. Some pieces up to 1.5 cm.
DR04-1-1 s : 3 slabs.

DR 04-1-2 : Pillow fragment of about 30 cm (radius). Glassy rim of 2-3 mm with thick Mn coating. Some plagioclase crystals resorbed. Abundant vesicles (0.5 to 1 mm).
DR04-1-2 g about 100 g. same description as sample DR04-1-2 g.

DR 04-1-3 : Pillow fragment of 50 cm (radius) with glassy rims and Mn coating. Thickness of the glass rim is about 2-3 mm. Resorbed plagioclase crystals and vesicles.
DR04-1-3 g about 300/350 g of altered glass.

DR 04-1-4 : Pillow with a radius of about 70 cm and 2-3 mm of glass. Elongated vesicles 1-3 mm. Resorbed plagioclases crystals (5 %).
DR04-1-4g : glasses extracted (about 200 g). Pieces of about 3 cm. Fresh glass but thin pieces.

DR 04-1-5 : Basalt with a very irregular shape. Some plagioclase in it. No glass. Initially 70*40*20 cm. 3 slabs and one piece have been selected. About 900 g of glass extracted from this sample.

Glass Description :

DR 04-2-1g : 20 g. Not fresh with Mn.
DR04-2-2g : About 10 g. Not fresh with Mn.
DR04-2-3g : 15 g. Fresh glass. Some pieces of altered glass. Size up to 2.5 cm.
DR 04-2-4g : (2 bags) : 100 g Median quality.
DR 04-2-5g : (2 bags) : Altered glass with Mn and oxides. Small pieces < 10 g.
DR04-2-6g :
DR 04-2-7g :
DR 04-2-8g
DR04-2-9g : (2 bags) : 20 g of altered glass with Mn and plagioclase crystals (not brilliant). Pieces up to 2 cm.

DR04-2-10g :<10 g. Some pieces are fresh. Thin pieces of glass.
DR 04-2-11g : 100 g. Large chuncks. Some are fresh.
DR04-2-12g : About 20 g. Size up to 0.6 cm with plagioclase crystals.
DR 04-2-13g : 40 g. Some pieces are 2 cm. Altered and fresh glass.
DR04-2-14g : (2 bags) : About 40 g. Some pieces are fresh.

About 480 g. of glass extracted from this second selection of basalts (Type 2)

SWIFT DR 05

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/02	36°10.5'E	44°51.7'S	1320
End	2001/03/02	36°9.8'E	44°51.3'S	1220

Photos: DR05.JPG ; DR5-1b.JPG ; DR05-1a.JPG ; DR05-1.JPG ; DR05-1-5.JPG ; DR05-1-1.JPG.

Site description: Volcano on the ridge which is the highest structure in the center of segment 3. Site close to sample # MD34-D7 (which is off axis).

MAPR: no

Dredge (weight and rocks)

200 kg, mostly pillow basalts, plagioclase phyric, oxidized sufaces.
glassy margins. Few pieces of ropey lava flows. No sediment. Trace of biological activity.
Tube: glass station : DR05 (1 bag). About 1.7 kg of mixed pieces of glass and rocks.
biology : 1 bag with shell plus 1 bag with coral (?) fragments.

Rock type :

Type 1 : 99%

Large pillow lavas, glassy margins a few mm to 1 cm thick – oxidation staining.
- 25% plagioclase phenocrysts, up to 1 cm in size.
- scarce (>>1%) olivine phenocrysts, up to 5 mm.

highly vesicular ; the vesicles are unevenly distributed and occur in zones parallel to the pillow surface where they rich up to 20%– generally 1mm in diameter, up to large holes.

Type 2 : 1%

Several pieces of ropey lava, highly vesicular, sparce plagioclase phenocrysts (>1%).

Sample description :

Type 1 :

DR05-1-1 : large rounded pillow lava ; 25cm radius, glassy margin.
1 glass bag, 3 slabs.
DR05-1-1 g : about 850 g of glass with abundant plagioclase crytals. Some pieces are oxidized.

DR05-1-2 : large rounded pillow lava ; 25cm radius, glassy margin.
DR05-1-2 g : 1 glass bag.
DR05-1-2 slabs : 3 slabs.

DR05-1-3 : large rounded pillow lava ; 25cm radius, glassy margin.
1 glass bag, 3 slabs.
DR05-1-3 g : same description as sample DR05-1-1 g (about 400 g).

DR05-1-4 : pillow fragment with 1 cm thick glassy margin (20 x 15 x 12 cm).

DR05-1-5 : pillow fragment with glassy margin contains 10% plagioclase crystals (up to 8 mm) and numerous vesicles of irregular shape (up to 8 mm).

SWIFT DR 06

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/02	36°28.1'E	44°53.9'S	2400
End	2001/03/02	36°27.5'E	44°53.5'S	2270

Photos: DR06-1(3).JPG ; DR06-2.JPG ; DR06.JPG ; DR6-1.JPG ; DR6-2-1.JPG.

Site description : Volcano on the eastern end of segment 3.

Dredge (weight and rocks)

About 500 kg of pillow basalts. 75% are aphyric or sparsely aphyric. 25% are plagioclase phyric.
Tube : 400g of glass (one bag).
sediments (one bag).

Rock Types :

Type 1: Large pillows with glass and aphyric samples. 5% vesicles up to 5mm in size.
Type 2 : Large pillows with glass and plagioclase phenocrysts. Some have olivine also.
Type 3 : Selection of small pillows with glass (generally aphyric). 11 samples have been selected for glass extraction (number 1 to 11).
Type 4 : Small pillow with glass (mostly aphyric). 4 samples have been selected.

Samples Description :

Type 1 :

DR 06-1-1 : Fragment of pillow. A lot of glass with nice vesicles of about 5 mm. Very small plagioclase microphenocrysts and occasionally plagioclase phenocrysts up to 0.5 cm.
DR 06-1-1g : About 250 g. of large pieces of fresh glass of about 2 cm.
DR 06-1-2 : Very large pillow fragment (we have selected a piece of about 3 kg). Aphyric with a glassy crust.
DR6-1-2g : About 40 g of very thin pieces of glass. Some are fresh.
DR 06-1-3 : Large pillow fragment 25 x 25 cm with a glassy rim of about 1-2 mm (nearly aphyric). Mn coating present on the surface. 5% vesicles up to 5 mm in size.
DR 06-1-3g **:** About 80 g of large pieces. Fresh inside the pieces.
DR 06-1-4 : Fragment of pillow (20 x 20 x 15 cm). Almost aphyric with some plagioclase phenocrysts up to 0.5 cm. Radial vesicules. Glassy margin with some oxidation**.**

Type 2 :

DR 06-2-1 : Fragment of a huge pillow (about 60 kg). Glassy crust with Mn and oxides. Plagioclase phenocrysts present with size up to 1 cm. The rim is Plagioclase enriched over 10 cm. Sparsely phyric in the interior.
DR 06-2-1g **:** About 250 g. Some pieces are fresh. They are generally coated with Mn and oxide but inside the glass seems fresh.
DR 06-2-2 : Fragment of a pillow (about 7 kg). Glassy margin with abundant plagioclase phenocrysts. The interior of the pillow is virtually aphyric.
DR 06-2-2g **:**About 160g (same description as DR06-2-1g).

Bags :

From the Tube (2 different bags) :
DR06 Glass station
DR06 sediment

Type 1 (large aphyric pillow)

DR06-1-1
DR06-1-1 glass
DR06 1-1 Slabs
DR06-1-2
DR06-1-2 Glass
DR06-1-3
DR06-1-3 Glass
DR06-1-3 Slabs
DR06-1-4
DR06-1-4 Glass

DR06-1-4 Slabs

Type 2 (large porphyric pillow)

DR06-2-1

DR06-2-1 Glass
DR06-2-2 Slabs

Type 3 (medium size pillow)

DR06-3-1g. About 50 g. Not fresh. No crystals.
DR06-3-2 :
DR06-3-3g : About 130 g. Some pieces seems OK.
DR6-3-4g : 60 g of very thin pieces of glass (not shiny).
DR06-3-5 : No slab. About 30 g (description like above).
DR06-3-6 : About 80 g (description like above).
DR06-3-7g : About 50 g. Rare plagioclase crystals. Descprition like above.
DR06-3-8 : Small sample ; fresh glassy margin of about 3 mm with some Mn (about 40 g). No slab.
DR6-3-9g : About 200 g. Some pieces are fresh but most of them are like description of the samples given above.
DR06-3-10g : About 80 g. Some pieces of good quality.
DR06-3-11g : large sample. No slab. About 60 g. Some are like sample DR06-3-10g.

Type 4 (medium size pillow with glass and plagioclase) :

Glass was not extracted from samples : DR06-4-1 ; DR06-4-2 and DR06-4-3.
DR06-4-4g : About 60 g. A lot of small plagioclase within the glass.

Bag number 16A : DR06 (1-1,1-2.1-3, 1-4) ; DR06 (2-1, 2-2), DR06 (3-1, 3-4, 3-7, 3-8, 3-10), DR06 (4-4).
Bag number ? (rest of the samples) : DR06 (4-1, 4-2, 4-3) and DR06 (3-2, 3-6, 3-9, 3-11).
Bag number ? : DR 06-3- and DR06-3-5.

SWIFT DR 07

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	01/03/03	36°45.1'E	44°49.1'S	3270
End	01/03/04	36°44.6' E	44°48.4'S	3050

Photos: DR07-1-3.JPG ; DR07-1-5.JPG ; DR07.JPG ; DR07b.JPG

Site description: Volcano of 450 m high on the eastern part of the discontinuity between segment 3 and 4.

MAPR: no

Dredge (weight and rocks)

40 kg of pillow basalts, mostly aphyric. Sediment.
Tube : mostly pelagic sediment, beige, colour chart = 16 (1 bag).
essentially one pillow fragment, Mn crust with a glassy rim of a few cm thick.
some glass : 1 bag glass (DR07-1-1g).
1 bag pillow broken pillow fragments.
about 100 g.

Rock Type :

Type 1 : pillow basalts, relatively old looking : Very scarce plagioclase phenocrysts (less than 1%), up to 5mm in size. Vesicles (1 mm) with irregular shape unevenly distributed : often concentrated in a zone 1 cm from the outer surface. The sample looks altered and has a glassy margin (only a few mm remain on some sample, a few mm thick Mn crust on some surfaces.

Sample description :

Type 1 :

DR07-1-1 : large pillow fragment (40 x 20 x 15 cm) with a glassy rim.
DR07-1-1g **:** About 100 g of glass. Some pieces seems quite fresh.
DR07-1-1slab **:** 3 slabs.

some samples have been preserved because they may contain some fresh glass in the rim, but very little.

DR07-1-2 – pillow fragment with possibly some glass on the outer margin
Mn crust (30 x 20 x 10 cm).

DR07-1-3 – fragment of pillow interior (30 x 15 x10 cm).

DR07-1-4 – pillow fragment with rim. Possibly some fresh glass. Vesicles are concentrated in a zone 1 cm away from the outer surface.

DR07-1-5 – small pillow fragment with rim. Possibly some fresh glass (7 x 5 x 5 cm).

DR07-1-6 – nice tube fragment, 12 cm in diameter. Vesicular. Mn coating. Possibly fresh glass.

SWIFT DR 08

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/03	37°15.95'E	44°36.65'S	2850
End	2001/03/03	37°16.30'E	44°36.10'S	2670

Photos: DR8-2.JPG ; DR8-2-5.JPG ; DR8-2-5(2).JPG ; DR8-2-1.JPG ; DR8-1-4b.JPG ; DR8-1-4.JPG ; DR08pillow.JPG ; DR08.JPG ; DR08-2-4.JPG ; DR8-1-3.JPG.

Site description: Volcano (300 m high) on the eastern flank of the high ridge of segment 4.

MAPR: no.

Dredge (weight and rocks)

200 kg of pillow basalts, a mixture of plagioclase phyric and aphyric types. No sediment. About 550 g of glass. Fresh glass.
Tube: 2kg of mixed pieces of glass in a soft sediment (one bag).

Rock type :

Type 1 : Plagioclase phyric (1% of plagioclase, 3mm in size) pillow basalts, including one 50 cm pillow and several smaller pillow fragments. Relatively old looking with altered glassy margin. The interior of the pillows are highly vesiculated and look scoriaceous. Plagioclase phenocrysts are up to 10 mm and form around 10% of the rock.

Type 2 : Fresh aphyric pillow fragments with 3-4 mm of fresh glass on the exterior of the pillows. The interior of the pillows appears massive. Sample DR-2-5 appears to have two lava types : a pillow with glass which has been covered by new lava which has flowed around and over it. A photograph was taken of this feature, and a sketch is shown in the dredge notebook.

Sample description :

Type 1 :

DR08-1-1 : Plagioclase-phyric pillow fragments with altered glass. Fragment of 30 cm pillow.
DR08-1-1g : 30 g. Seems like a powder.

DR08-1-2 : Plagioclase-phyric pillow fragments with altered glass.

DR08-1-3 : Plagioclase-phyric (5 mm, with an irregular distribution) pillow fragments with altered glass. Fragment of 50 cm pillow.

DR08-1-4 : Whole pillow, 25 cm in diameter and 40 cm long. Possibly some fresh glass. Accumulation of vesicles in a concentric zone 1 cm away from the outer surface. Plagioclase up to (8 mm) sometimes forming clusters. They are almost randomely distributed.

Type2 :

DR08-2-1 : Aphyric pillow basalt fragments with fresh glass rim up to 5 mm thick.
DR08-2-1g : About 160 g, very fresh with large pieces of about 1-2 cm.

DR08-2-2 : Aphyric pillow basalt fragments with fresh glass rim up to 5 mm thick.
DR08-2-2g : About 80 g of a very fresh glass. Large chunk of about 1 cm.

DR08-2-3 : Aphyric pillow basalt fragments with fresh glass rim up to 5 mm thick.
DR08-2-3g : About 80 g of a very fresh and shinny glass.

DR08-2-4 : Aphyric pillow basalt fragments with fresh glass rim up to 5 mm thick. The sample is two pillow lavas in contact with 2 glassy margins. The glass was extracted from the outer glassy rim (the most recent lava flow : DR08-2-4 #1) and from the inner glassy rim (the older lava flow : DR08-2-4#2). A couple of photos by Cecile.

DR08-2-5 : Aphyric pillow basalt fragments with fresh glass rim up to 5 mm thick.
DR08-2-5g : About 40 g of fresh glass. Some with Mn.

DR08-2-6 : Aphyric pillow basalt fragments with fresh glass rim up to 5 mm thick.
DR08-2-6g : About 80 g of very fresh glass. Some with Mn and oxides in joints.

DR08-2-7 : Aphyric pillow basalt fragments with fresh glass rim up to 5 mm thick.
DR08-2-7g : 80g of very fresh glass.

DR08-2-8 : Aphyric pillow basalt fragments with fresh glass rim up to 5 mm thick.
DR02-2-8g : About 50 g of fresh glass.

DR08-2-9 : Aphyric pillow basalt fragments with fresh glass rim up to 5 mm thick.
DR08-2-9g : About 60 g of relatively fresh glass. No crystals and almost no Mn.

SWIFT DR 09

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	01/03/04	37°30'E	44°37.9'S	2730
End	01/03/04	37°29.64 E	44°37.7'S	2600

Photos: DR09-1.JPG ; DR09.JPG ; DR9-1-1.JPG ; DR9-1-3.JPG.

Site description : Eastern part of a little volcano (200 m high) in the center of segment 4.

MAPR : no.

Dredge (weight and rocks)

About 150 kg of pillow basalts. No sediment.
Tube: on bag of glass.

Rock Types :

Type 1: Slightly plagioclase phyric pillow lava with plagioclase of about 0.5 mm size variably concentrated towards pillow rims. Up to 5% to 30% in some samples. Glassy rim of 1-3 mm, some Mn coating on glass. Iron oxidation along joints. Occasional tiny vesicles.

Samples Description :

Type 1 :

DR09-1-1 : Pillow lava with radius of about 25 cm. Glassy rim of about 2 mm with Mn coat of about 0.1 mm. Occasional partially resorbed plagioclase crystals of 1-2 mm. Abundant small vesicles < 0.1 mm.

DR09-1-1g : glass of above. 40 g (inside the pieces the glass is fresh).

DR09-1-1s : 3 slabs of above.

DR09-1-2 : Pillow lava with a radius of about 50-60 cm. The glassy rim is 1-5 mm thick. Mn coating the rim of about 0.2 mm thick. Occasional plagioclase crystals (2-5 mm), often resorbed. Abundant small vesicles < 0.1 mm.

DR09-1-2g : glass of above (130g. Some glass with Mn and oxide in cracks).

DR09-1-2 s : 3 slabs of above.

DR09-1-3 : Pillow lava with a radius of about 25 cm. The glassy rim is 1-2mm thick, with Mn coat. Occasional resorbed plagioclase crystals 1-3mm, and a few olivines crystals (2mm). Abundant samll vesicles (<0.1mm).

DR09-1-3g : glass of above. Glass is fresh. Large chunks of about 1-2 cm. Some are Mn rich. Rare plagioclase. About 130 g.

DR09-1-3s : 3 slabs of above.

DR09-1-4 : Pillow lava with a radius of about 15cm, with a glass rim (1-2mm), and Mn coat (<0.1mm). Occasional plagioclase crystals (1-2mm) resorbed, and abundant vesicles 0.1-1mm.

DR09-1-4g : glass of above. Not fresh and not shiny.

DR09-1-4s : slabs of above.

DR09-1-5 : Pillow lava with a radius of 15cm. The glass rim is <1mm with a Mn coat. The pillow contains occasional resorbed plagioclase crystals (1-6mm) and rare olivines. Abundant small vesicles <0.1mm.

DR09-1-5g : glass of above. Some crystals in th glass.

DR09-1-5s : slabs of above.

DR09-1-6 : Pillow lava with a radius of about 20cm. The glassy rim is 1-2mm with Mn coat. Occasional plagioclases (1-5mm) are resorbed and no resorbed. The crystals are more concentrated in the glass rim. Abundant vesicles 0.1mm.

DR09-1-6g : glass of above. About 50 g. Some pieces are shiny.

DR09-1-6s : slabs of above.

DR09-1-7 : Fragment (10 x 10 x 10 cm). Thin glass rim ≈1mm with Mn coat. Occasional plagioclases crystals 1-2mm and abundant vesicles <1mm.

DR09-1-7g : glass of above

DR09-1-7s : slabs of above.

DR09-1-8 : Fragment of pillow lava (10 x 5 x 5 cm). The glass rim is 1mm thick with a Mn coat. Rare plagioclases crystals 0.5-2mm and abundant small vesicles (<0.1mm).

DR09-1-8g : glass of above

DR09-1-8s : slabs of above.

DR09-1-9 : Pillow fragment of about 15cm radius. The glass rim is <1mm with Mn coat. Occasional resorbed plagioclases (1-5mm). Abundant small vesicules <0.1mm.

DR09-1-9g : glass of above. About 70 g. Some pieces are very shiny but usually crystallized.

DR09-1-9s : slabs of above.

DR09-1-10 : Pillow lava 25 cm long and a radius of 15cm. The glass rim 1-3mm thick and has a Mn coat. Abundant vesicles are present (<0.1mm), and big plagioclase crystals toward rim ~25%. No slab and glass sampled.

Glass Station : One bag of 600 g of glass.

SWIFT DR 10

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/05	39°41.12'E	43°21.37'S	3120
End	2001/03/05	39°40.95'E	43°21.30'S	3060

Photos: DR10-2-1 ; DR10-2-1.

Site description: Volcano (150 m high) on the western flank of segment 6.

MAPR : no.

Dredge (weight and rocks)

About < 80 kg of porphyritic pillow lava. Material is plagioclase phyric (about 5% crystals, size up to 5 mm diameter). One large pillow 40*30 cm, the sample being plagioclase phyric with glassy exterior. Appears very similar to material in sediment tube. Also pillow fragment of about 20 x 20 cm of same material and assorted smaller pieces. No material dicarded.
The tube was full of very fresh glass and sediment. Small pillows and pillow fragments of about 8 cm (diameter) with fresh glassy rim up to 1 cm. Some Fe staining on the surface but glass appears very fresh. Material is plagioclase phyric about 5% (size up to 5 mm diameter).

Rock Types :

Type 1 : Plagioclase phyric basalt with glassy rims. Plagioclase up to 5 mm (about 5%).

Type 2 : Two large pillow fragments (40 x 30 cm and 20 x20 cm) with multiple glass rinds separated by 15 cm.

Type 3 : 10 samples from the glass station have been selected and their glass extracted. All these samples are quite similar (small pillow lava of about 10 cm long and a diameter of about 5 cm). Bag number 11 is a mixing of different little pieces from probably the same lava type. This bag represents another kind of glass (no crystals).. A bag of foraminifers has been made.

Samples description :

Type 1 :

DR10-1-1 : 10 x 10 cm pillow fragment. Glass present. Plagioclase (1- 2 mm).
DR10-1-1g : Glass with Mn and surface oxidation.
DR10-1-2 : 20 x 15 cm pillow fragment. Slab cut.
DR10-1-3 : 5 x 5 cm glassy fragment.
DR10-1-4 : Thin glass rim of about 1 mm.
DR10-1-5 : Plagioclase rich sample of about 2-3 mm.
DR10-1-5g :small amount of glass.
DR10-1-6 : Plagioclase rich basalt (size up to 3-4 mm). Trace of alteration and Mn.
DR10-1-6g : Not enough glass to work with (excpted microprobe analyses).
DR10-1-7 : 8 little pieces of glass with some plagioclase.

Type 2 :

DR-10-2-1 : Large plagioclase phyric with multiple glass. Glasses come from two layers (2 cm thick) has been collected. This blocks has not been broken or sawed.

Type 3 :

DR10-3-#1g : Very fresh glass with Plagioclase phenocrysts. Some Mn coating the glassy rims. Small pillow lava. About 200 g.
DR10-3-#2g : About 280 g of very fresh glass. Seems like sample DR10#1g.
DR10-3-#3g : About 290 g. Probably same as #1 and 2. It seem to be the freshest sample from this dredge.
DR10-3-#4g : About 100 g. Very fresh glass with plagioclase and Mn.
DR10-3-#5g : 100 g. Very fresh glass with plagioclase and Mn.
DR10-3-#6g : Small pieces of fresh basaltic glass (about 10 g). Plagioclase crystals (some > 0.5 cm) and Mn.
DR10-3-#7g : Less fresh with Mn coating (about 20 g).
DR10-3-#8g : 30g. One piece of glass (3 x 3 x 3 cm). Fresh with some Mn.
DR10-3-#9g : About 30 g. One piece of glass (3 x 3 x 1 cm). Trace of Mn.
DR10-3-#11 g: A bag of different pieces of fresh glass (no crystals in it). These chunks of glass are obviouly different from those quoted above.

Listing of samples after glass extraction :

DR10-3-#1 Rest. Piece of pillow without the glass which has been extracted (DR10#1g).
DR10-3-#2 Rest. Piece of pillow without the glass (DR10#2g).
Dr10#6 Rest. Piece of about 5 x 5 cm from which glass has been extracted.
DR10-3-#7. Rest. Piece of about 3 x 3 cm (with DR10#7g).

SWIFT DR 11

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	01/03/05	39°49.70' E	43°23.00' S	2880
End	01/03/05	39°49.25' E	43°22.90' S	2780

Photos: DR 11.JPG ; DR11tube.JPG ; DR11tubeb.JPG.

Site description: Easter flank of a volcano (400 m high) in the center of segment 6.

MAPR: no

Dredge (weight and content)

The dredge was empty. The net was tangled with the teeth. A few biological fragments (white branches… see photo)
Tube : 2.2 kg of foraminifer mud, with glass shards, apparently fresh, and some transparent grains (plagioclase crystals?).

Samples :

One bag from the glass station (forams + glass), 2.2kg.
One bag with biological samples.

SWIFT DR 12

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/06	39°56.30'E	43°22.30'S	2860
End	2001/03/06	39°55.80'E	43°21.95'S	2760

Photo SWIFT DR12a.JPG ; DR12.JPG ; DR12-2.JPG ; DR12-1-1.JPG.

Site description: Eastern flank of a volcano (200 m high) in the center of segment 6.

MAPR: no.

Dredge : (weight and rocks)

Content: <50 kg of plagioclase phyric pillow and lava fragments.

Rock type :

Types 1 : Pillows (Single large pillow), plagioclase phyric (20 to 30%).

Type 2 : Lava fragments, flattened blocks about 5 cm thick with glassy rims about 5 mm and plagioclase phyric concentrated towards rim.

Samples description :

Type 1 :

DR12-1-1 : Pillow about 20 cm radius, glass rim 5 mm thick with strong Mn coating. Plagioclase phenocrysts 2 to 10 mm resorbed, about 20 to 30% in abundance.

DR12-1-1g :

DR12-1-1slab :

Type 2 :

DR-12-2-1 : Lava surface (20 x 20 x 5 cm). Glassy rim 5 mm thick with Mn coating. Plagioclase phenocrysts 1 to 5 mm resorbed, about 20% in abundance. Rare olivine crystals about 1 mm in size. Glass and slab samples.

DR-12-2-1g :

DR-12-2-1slab :

DR-12-2-2 : Contact between part of a pillow and a lava flow (50 x 20 x 10 cm). Glassy rim 2 to 3 mm. Mn coating on surface. Plagioclase crystals.

DR-12-2-3 : Lava flow fragment (10 x 5 x 5 cm). Glassy rim 2 mm thick with thin Mn coating. Plagioclase phenocrysts 1 to 5 mm strongly concentrated towards rim. Rare vesicles less than 0.1 mm.

DR-12-2-4 : Lava flow fragment (10 x 10 x 5 cm). Glassy rim 1 to 2 mm thick with thin Mn coating. Plagioclase phenocrysts 1 to 5 mm resorbed, about 20% in abundance. Rare vesicles less than 0.1 mm.

DR-12-2-5 : Lava flow fragment (15 x 10 x 5 cm). Glassy rim 3 mm thick with thin Mn coating. Plagioclase phenocrysts 1 to 10 mm about 40% in abundance. No vesicles. Massive.

DR-12-2-6 : Lava flow fragment (15 x 10 x 5 cm). Glassy rim 1 to 3 mm thick with Mn coating. Plagioclase phenocrysts 1 to 5 mm mostly concentrated towards rim. Occasionnal vesicles, less than 0.1 mm.

DR-12-2-7 : Lava flow fragment (25 x 15 x 5 cm). Glassy rim 1 to 2 mm thick with thin Mn coating. Plagioclase phenocrysts 1 to 5 mm mostly concentrated towards rim, resorbed. Occasional vesicles, less than 0.1 mm.

DR-12-2-8 : Lava flow fragment (20 x 10 x 5 cm). Glassy rim 2 to 5 mm thick with thin Mn coating. Plagioclase phenocrysts 2 to 10 mm about 30% in abundance, resorbed. Rare vesicles.

DR-12-2-9 : Lava flow fragment (50 x 20 x 10 cm). Thin glassy rim 1 mm thick with thin Mn coating. Resorbed plagioclase phenocrysts 2 to 10 mm in size. Rare vesicles.

SWIFT DR 13

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/06	49°58.40'E	43°24.13'S	2880
End	2001/03/06	49°58.18'E	43°23.87'S	2790

Photo SWIFT : DR13.JPG ; DR13-1.JPG.

Site description: Southern flank of an elongated ridge on the eastern end of segment 6.

MAPR: no.

Dredge (weight and content)

Content (weight and rocks) : > 100 kg. Appears to be only one type. Pillow fragments up to 50 by 30 cm. Many have good, fresh, glassy rims. Mostly aphyric, possibly olivine and cpx visible in cut surface.
Tube : very little sediment containing small fragments of rocks with minor glass.

Rock type :

Type 1 : Aphyric (<1% olivine and possibly plagioclase microphenocrysts). Several large pillow fragments + many smaller ones. Excellent fresh glass up to 10 mm thick on exterior.

Samples description :

Type 1 :

DR13-1-1 : large 50 x 40 cm pillow.
DR13-1-1g :
DR13-1-1slab :
DR13-1-2 : large 30 x 40 cm pillow.
DR13-1-2g :
DR13-1-2slab :
DR13-1-3 : 30 x 15 cm pillow fragment.
DR13-1-4 : 30 x 15 cm pillow fragment.
DR13-1-5 : 30 x 15 cm pillow fragment.
DR13-1-5g :
DR13-1-6 : 30 x 15 cm pillow fragment.
DR13-1-6g :
DR13-1-7 : 30 x 15 cm pillow fragment.
DR13-1-7g :
DR13-1-8 : Large pillow fragment 30 x 30 cm.
DR13-1-8g : Looks old.
DR13-1-8slab :

SWIFT DR 14

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/06	40°06.00'E	43°24.05'S	2700
End	2001/03/06	40°05.65'E	43°23.80'S	2640

Photo SWIFT DR 14 – 3 JPG ; DR14.JPG ; DR14type3.JPG.

Site description : 100 m high elongated structure on the eastern flank of segment 6.

MAPR: no.

Dredge : (weight and rocks):

400 kg basalts, mostly pillow-lavas, fresh looking. Glassy crusts up to 1 cm thick. No Mn crust, oxidation staining.
Tube : 5kg of fresh glass (1 bag) in soft sediment. Two shell fragments and one « coral » branch (1 bag).

Rock type :

Type 1 : 94%, Aphyric pillow lavas, with fresh glassy margins up to 1 cm but generally a few millimeter thick. The pillow diameter varies between 10 and 20 cm. Some samples contain 2-3 % plagioclase microphenocrysts. Occasional few vesicles. Some oxidation staining on the glassy surfaces, but no Mn crust.

Type 2 : < 1%, several pieces of sheet flow, a few cm thick, with very fresh glassy crusts, 1 cm thick. Aphyric, no vesicles, very similar to type 1, but flat.

Type 3 : 5%, Porphyritic pillow lavas with up to 5% plagioclase phenocrysts. In some pillows, the phenocrysts tend to concentrate in the outer rim, while in others they are more evenly distributed. The glassy crust is very small (a few mm maximum). They look older than type 1. Small rounded vesicles of 1mm or less in diameter (around 1%). No Mn crust.

Samples description :

Type 1 :

DR14-1-1 : large block consisting of two pillow-lavas in contact with each other, each of them with a radius of 20 cm. At the contact between the two pillows a thick glassy crust is preserved (1cm). Aphyric. DR14-1-1g : Large pieces of very fresh glass. No crystals. Blue coating on some pieces and some pieces with Mn (160g).
1 glass bag – 2 slabs.
DR14-1-2 : Large aphyric pillow-lava, thick glassy margin.
1 glass bag (170g). Same as DR14-1-5g.
DR14-1-3 : Small aphyric pillow lava.
1 glass bag. Mixture of fresh and altered glass. No crystals. Some with Mn.
DR14-1-4 : Small aphyric pillow-lava.
1 glass bag (150g). DR14-1-4g : Very fresh glass – shiny. Some Mn on surface. Almost no crystals.
DR14-1-5 : Small aphyric pillow-lava.
1 glass bag. DR14-1-5 : Fresh glass. Pieces of about 1 cm.
DR14-1-6 : Small aphyric pillow-lava.
1 glass bag (220 g). DR14-1-6g : Very fresh glass. However, some pieces with Mn. No crystals.
DR14-1-7 : Small aphyric pillow-lava.
1 glass bag (100 g). DR14-1-7g : Fresh glass, little pieces and some thin glassy crust. Mn on it.

Type 2 :

DR14-2-1 : Large piece (20x10x4) of lava flow with a thick glassy crust (2cm)
1 glass bag (70 g). DR14-2-1 g : Fresh glass (not very shiny).
DR14-2-2 : Small piece of lava flow.
1 glass bag (80 g).DR 14-1-2 g : Fresh glass no plagioclase with some Mn on it.

Type 3 :

DR14-3-1 : large pillow lava (20 cm in radius) with thin glassy rim. Plagioclase phenocrysts mostly concentrated in the rim

1 glass bag (60g) – 2 slabs. DR14-3-1 g : Mixture of Plagioclase and glass. Some pieces are fresh. Plagioclase are > 2 mm up to 1 cm. Relatively fresh.
DR14-3-2 : 1 small pillow lava with thin glassy margin – plagioclase phenocrysts (2-3%) mostly concentrated in the rim. Abundant vesicles.
1 glass bag (50 g), 1 slab. DR14-3-2g : Mixture of plagioclase and pieces of glass. Some small pieces are fresh. Plagioclase ranging from 1 to 5 mm.
DR 14-3-3 : Large pillow lava with a thin glassy margin a few mm thick. Plagioclase phenocrysts (up to 5mm) are concentratd in the rim.
1 glass bag DR14-3-3g

SWIFT DR 15

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/06	40°12.55'E	43°.26.00'S	3000
End	2001/03/06	40°12.35'E	43°25.65'S	2800

Photo SWIFT DR 15-JPG, DR 15-1-1-JPG, DR15-1-a and b-JPG, DR 15-1-2-JPG, DR 15-2-5-JPG.

Site description: Volcano (220m high) at the eastern end of the segment 6.

MAPR: no.

Dredge (weight and rocks)

200 kg of fresh porphyritic and aphyric basalts. The basalts exhibit a glassy rim up to 1-2 mm thick. Plagioclase can be concentrated in the rims (up to 40%, mean 20% - inner part is aphyric).
Tube : abundant very fresh glass.

Rock type :

Type 1 : Porphyritic basalts with pagioclase phenocrysts up to 10 mm. Plagioclase can be concentrated in the rim (up to 40%, the mean concentration of phenocrysts is 5%). In this case, the inner part of the pillow is aphyric.
Type 2 : Aphyric basalts exhibiting a glassy rim up to 2mm thick.
The total amount of glass recovered is about 1 kg (50 % / 50%).

Sample description :

Type 1 : Porphyritic basalts

DR-15-1-1 : Pillow radius 30 cm. Glassy rim 2 to 3 mm with Mn coating. Plagioclase phenocrysts 1 to 10 mm strongly concentrated in rim (see attached photograph DR15-1-1.JPG).
DR-15-1-2 : Pillow radius 40 cm, glassy rim 3 mm with Mn coating. Plagioclase phenocrysts 2 to 25 mm seem concentrated in centre and rim.

Type 2 : Aphyric basalts

DR 15-2-1 : Pillow fragment radius 25 cm, thin glass rim about 1 to 2 mm with thin Mn coat less than 0.1 mm. Aphyric basalt.

Glass description :

DR15-1-1g (second selection) : fresh glass with large plagioclase crystals (1-2 mm) about 220g.
DR15-1-2g : Mixture of pieces of fresh glass and plagioclase phenocrysts (some >5 mm). About 290g.
DR15-2-1 g : Small and thin pieces of fresh glass. No crystals. Some Mn, but rare. About 40 g.
DR15-2-4g : Thin pieces of fresh glass. About 80 g.
DR15-2-5 g : Large pieces of fresh glass (no crystals). Some pieces > 2 cm. Relatively thin. About 240 g.
DR15-2-6g : Fresh glass. No crystals. Small pieces (80 g).
DR15-2-7g : Large pieces (some about 2 cm and less) of fresh glass. No crystals.

SWIFT DR 16

	Date	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/07	39°33.90'E	43°23.10'S	3100
End	2001/03/07	39°33.50'E	43°23.30'S	2850

Photos: DR16b.JPG ; DR16a.JPG ; DR16.JPG ; DR16-2-2 ; DR16-2-1 ; DR16-1-2.JPG ; DR16-1-1.JPG.

Site description: North-eastern flank of 350 m high elongated structure on the western end of segment 6.

MAPR: no.

Dredge (weight and rocks)

About 200 kg of samples (most likely talus rocks). Very little old glass.
Tube : A little bit of sediments + glass.

Rock type :

Type 1 : most frequent, basalts without glass or vesicles. Plagioclase (0.5 to 1.0 mm) about 15% in abundance. Plagioclase phenocrysts are sometimes concentrated towards the rim. Some inner parts are then aphyric.
The microcrystalline matrix is brown sometimes greenish.

Type 2 : Same rock as Type 1 but vesicular (2 samples collected DR 16-2-1 et DR 16-2-2).
Type 3 : Same rock as Type 1 with glass often rounded shape (pillow-lava ?).
Type 4 : Tube glass + Sediments.

Samples description :

Type 1
DR16-1-1 aphyric, small plagioclase (1 mm)
DR16-1-2 Moderatly phyric with some plagioclase (5 mm). Parts of the sample contain brown vesicles of 1 to 2 mm in diameter.
DR16-1-3 Moderately phyric with some plagioclase (5 mm).
DR16-1-4g (about 80 g) : Altered glass (green and brownish). Nothing to do with that.

Type 2
DR16-2-1g (140 g) : Glass is not very fresh. Some little pieces seems OK. Mn and oxides on surfaces. Some plagioclase about 2 mm, < 3% in abundance. Vesicles.
DR16-2-2 g (60 g). Altered glassy sample with fractures. The glass contains plagioclase phenocrysts in the inner part (up to 2 mm in size). Same as DR16-1-4g.

Type 3
DR16-3-2 g (40g). Not glassy. Pl rich basalt. Pl>5%. Mn and oxides.
DR16-3-3g (40 g). From a plagioclase rich basalt. Small pieces of fresh glass with a large amount of plagioclase in it (>2%).

SWIFT DR 17

	Date	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/07	40°41.80'E	43°53.40'S	2550
End	2001/03/07	40°41.55'E	43°53.25'S	2400

Photos: DR17tube.JPG ; DR17b.JPG ; DR17.JPG ; DR17-3.JPG ; DR17-1-4.JPG

Site description: Southern flank of a small volcano (100 m high) on the western end of segment 7.

MAPR: no

Dredge (weight and rocks)

About 5kg of samples, 7 pieces of the top of pillow, with fresh glass and large plagioclases. The Tube was full, i.e. : 5kg of sediments.
Tube : 5 kg of sediments with little pieces of glass (fresh and altered glass) (2 bags) . 1 bag of the largest glass pieces, 1 bag of smaller sized pieces.

Rock type :

Type 1 : Basalt with large resorbed plagioclases (some of then are about 2-3cm, and about 30% in abundance) and small olivines cemented by microcrystalline to fresh glassy matrix.

Sample description :

DR17-1-1 : Litle sample : the radius is about 5cm. No glass of this sample.
DR17-1-2 :
DR17-1-2 g : 20g of altered glass with plagioclase.
DR17-1-2 : Rest.
DR17-1-3 : Samples with glass, plagioclase, olivine and cpx.
DR17-1-3 g : About 100g of beautiful glass with phenocryts.
DR17-1-3 * : 2 slices of the sample which present olivine, plagioclase and clinopyroxene.
DR17-1-3 : rest.
DR17-1-4 :
DR17-1-4 g : 20 g of little pieces of glass and very big plagioclase (1-2cm).
DR17-1-4 : Remaining material.
DR17-1-5 : Altered sample with Mn coat, glass and plagioclase.
DR17-1-6 :
DR17-1-6 g: 10g of altered glass and Mn coat, little pieces of fresh glass.
DR17-1-6 : Rest.
DR17-1-7 :
DR17-1-7 g: 35g of altered glass and large plagioclase crystals (up to 2 cm).
DR17-1-7 : Rest.

Sample description :

DR17-1-2g : Mixture of glass and plagioclase phenocrysts. Porphyritic basalt with plagioclase. Some plagioclase crystals are altered. Small fresh pieces of glass. About 60 g.
DR17-1-3* : Porphyritic basalt with large plagioclase phenocrysts. Melt inclusions are obvious in plagioclase of about 2 cm. Olivine is in contact with plagioclase. The large plagioclase phenocrysts are resorbed (500 g). The proportion of plagioclase is about 10% and 1% for olivine. Fresh glass present. The glass however was not extracted.
DR17-1-3 g : Porphyritic basalt. The bag is a mixture of plagioclase and pieces of glass. Some Mn. The glass is fresh. No olivine. About 200 g.
DR17-1-4g : Porphyric Plagioclase basalt (some are bout 1 cm). Some pieces of fresh glass. Hand picking required (about 40 g).
DR17-1-6g : Less porphyritic than the other samples (few% of plagioclase) of the dredge. Some Mn. Very small fresh glass pieces (about 20 g).
DR17-1-7g : Very porphyritic basalt (plagioclase >20%) with large phenocrysts > 1 cm. Some fresh pieces of glass. Plagioclase crystals are strongly resorbed (about 70 g).

SWIFT DR 18

	yyyy/mm/dd	hh:mm	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/08	01 :17	40°34.65E	43°51.76S	2952
End	2001/03/08	02 :36	40°34.33E	43°51.22S	3048

Photos: DR18.JPG ; DR18-1-4.JPG ; DR18-1-1.JPG.

Site description: Western part of the central high of the segment 7. Dredge on the northern flanks of an east-west oriented valley.

MAPR: no.

Dredge (weight and rocks)

About 40 kg of pillow basalt, not very fresh.

Tube : sediments (chart color n°16) (one bag). About 5 pieces of glassy crust with Mn. No crystals. Some fresh glass (one bag). Careful handpicking required.

On Deck (equivalent to glass station) : Some pieces seem to be fresh inside the crust. About 20 different glassy crustswith Mn and trace of sediment (200 g).

Rock type :

Type 1 : Aphyric with tiny microphenocryts (<5 mm, one sample has some phenocrysts of 1 to 2 mm) of plagioclase. No Mn crust. The glassy margin is totally gone. About 1% of vesicles (of about 1 mm).

DR18-1-1 : Large pillow lava (about 20 cm diameter) with a scoriaceous center. Some altered glass (< 1 mm). One slab and one glass bag.

DR18-1-2 : Small pillow lava (sampled by Benoit Ildefonse). One slab.

Sample description :

Some samples with glass. Only one sample had glass separated from it.

DR18-1-1g : Not fresh (50 g).

DR18-Tube : About 5 pieces of glassy crust with Mn. No crystals. Some fresh glass. Careful handpicking is required (80 g).

SWIFT DR 19

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/08	40°48.40'E	43°53.50'S	1970
End	2001/03/08	40°48.15'E	43°53.15'S	1919

Photos: DR19a.JPG ; DR19.JPG ; DR19-1.JPG ; DR19-1-6a.JPG ; DR19-1-6.JPG ;

Site description: Western end of the segment 7. Southern flanks of a conical structure about 100 m high.

MAPR: no.

Dredge (weight and rocks)

Less than 5kg in total for 8 samples.

Rock type :

Type 1 : Plagioclase-rich (up to 60%) basalt. The 8 samples are highly porphyric basalts with abundant large and resorbed plagioclases with thin glassy rim and Mn coating. The biggest sample has two glassy crusts of a lava flow.

Sample description :

DR19-1-1 : Fragment (10 x10 x 5 cm). Thin glassy rim < 0.1cm and thin Mn coat. Plagioclase crystals from 2 to 20 mm (60%). Olivine occurrence (≈1 mm). No vesicles, no glass extracted.
DR19-1-2 : Fragment (15 x 5 x 5 cm). Thin glassy rim 1mm and Mn coat. Plagioclase crystals from 2 to 20 mm (60%). Olivine occurrence. No vesicles,. no glass extracted.
DR19-1-3 : Fragment (10 x 10 x 5cm). Thin glassy rim 1mm and Mn coat. Plagioclase crystals from 2 to 15 mm (60%). No identified olivines. No vesicles. No glass extracted.
DR19-1-4 : Fragment (15 x 10 x 5 cm). Very thin glassy rim on some part of the fragment and Mn coat more extensive than for the other sample. Plagioclase crystals from 2 to 30mm (60%). No glass extracted.
DR19-1-5 : Fragment (15 x 5 x 5 cm). Thin glassy rim <1mm and a relative extensive Mn coat. Plagioclase phenocrysts from 1 to 30 mm (60% in abundance). Olivine. No glass extracted.
DR19-1-6 : Fragment (10 x 10 x 5 cm). Fresh glassy rim ≈ 2 mm and very little Mn coating. Plagioclase phenocrysts from 1 to 20 mm (60%). Olivine occurrence. No vesicles. Slabs.
DR19-1-7 : Fragment (25 x 20 x 15 cm). Glassy rim ≈2 mm coverd by a thin Mn coat. Plagioclase phenocryst from 2 to 10 mm (60%). Olivine occurrence. No vesicles. 2 slabs with olivines and plagioclases.
DR19-1-8 : Fragment (25 x 20 x 10 cm). Fresh glassy rim ≈2mm and very little Mn coat. Plagioclase phenocrysts from 2 to 25 mm (60%). Olivine occurrence. No vesicles. 1 slab with olivines and plagioclases.
DR19-1-9 : The bigest sample, fragment (30 x 20 x 20 cm). Very fresh glassy rim ≈ 2 mm and very litle Mn coat. Plagioclase phenocrysts from 2 to 25 mm (60% in abubdance). Olivine occurrence. No vesicles. 2 slabs with olivines and plagioclases.

Glass description :

Total mass of glass extracted is about 260 g.
DR19-1-9g : Mixture of small pieces of basalt, glass, plagioclase and Mn (rare). Altered rocks. Plagioclase content > 30%. Not very fresh. About 100 g.
DR19-1-8g : Very plagioclase phyric. Almost no glass. Large plagioclase up to 1 cm. No alteration. About 50 g.
DR19-1-7g : Very altered glass – brown. A lot of pieces of plagioclase and Mn. Some rare piece of fresh glass. About 20 g.
DR19-1-6g : Mixture of pieces (Plagioclase, glass, basalt). Some are glassy. Some of them can be used at least for major element. About 90 g.

SWIFT DR 20

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/08	43°55.20'E	40°56.30'S	2700
End	2001/03/08	43°54.90'E	40°56.15'S	2600

Photos: DR20.JPG ; DR20a.JPG ; DR20b.JPG ; DR20c.JPG ; DR20d.JPG ; DR20e.JPG ; DR20f.JPG ; DR20g.JPG ; DR20h.JPG.

Site description: Small volcano (100 m high) on the eastern side of segment 7.

MAPR: no.

Dredge (weight and rocks)

4 kg of sheet flows, very fresh, with plagioclase phyric.
Tube : 10 x 5 cm slab of glassy striated crust (photo). (one bag). One bag of sticky sediments (chart color n°16).

Rock description :

Only one type : sheet flow fragments

Type 1 : 2 to 6 cm thick sheet flow fragments with 20% plagioclase phenocrysts (up to 15 mm). Well preserved 1 cm thick glassy crust (striations on the glassy surfaces (no erosion at all)), without Mn. Dripping surface beneath. Some oxidation staining.

Glass description :

DR20-1-1 : Sample (10 x 4 x10 cm) with a very fresh glassy top, with plagioclase often resorbed. The glassy margin is about 8.5 to 8.8 cm.
DR20-1-2 : Sample (10 x 5 x 10 cm) glassy on both sides. The glass is very fresh, with plagioclase often resorbed, same as DR20-1-1.
DR20-1-3 : Sample very flat (sheet flow again) (13 x 7 x 3 cm) same type as DR20-1-1 and 1-2.
DR20-1-4 : Very fresh and cute sample, even fresher than the list above. Some glass has been extracted. A very large piece (15 x 10 x 4 cm) is bagged. It seems different than sample DR20-1-1 and 1-2 (more recent).
DR20-1-5 : Large flat glassy crust with plagioclase megacrysts (in a box).

Series of samples with no glass extraction. No slab for these samples.
DR20-1-6 : 5 x 5 x 2 cm.
DR20-1-7 : 7 x 4 x 2 cm.
DR20-1-8 : 18 x 10 x 2 cm. Fresh glass on one side.
DR20-1-9 : 4 x 3 x 2 cm, with fresh glass.
DR20-1-10 : 4 x 3 x 2 cm, with fresh glass.

SWIFT DR21

	yyyy/mm/dd	time	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/08	23 :55	41°29.30'E	43°23.10'S	3050
End	2001/03/09	01 :05	41°28.60'E	43°22.8'S	2650

Photos: DR21.JPG ; DR21-1-1.JPG.

Site description: Off axis dredge on 10Ma crust on the flanks of the western wall of the Discovery fracture zone.

MAPR: no.

Dredge (weight and rocks)

1 kg of old looking small pillow basalts, mostly aphyric. No glass, thin Mn crust (1mm)
tube: one pebble of pinkish quartzite (5 x 3 x 2 cm) with soft sediments. 1 bag of small fragment from the tube and 1 bag of sediment from the tube (chart color 16). One half kept, the rest to DLC

Rock description :

Type 1 : old looking pillow basalts, mostly aphyric with altered glass and covered by a thin (1mm) Mn crust, small (<1mm) 1% vesicles.
Type 2 :small pebble (polished) of pinkish quartzite. Dropstone ? (5 x 3 x 2 cm)

Sample description :

DR21-1-1 : piece of pillow-lava, 10cm radius. Mostly aphyric, with very scarce plagioclase phenocrysts (<1%)/. 2 cm thick alteration halo. Small vesicles some filled with orange material.
1 slab kept, the rest to DLC
DR21-1-2 : same as above, but smaller
1 slab kept, the rest to DLC
DR21-1-3 : same as above, small fragment from the tube (5 x 4 x 8 cm)
1 half kept, the rest to DLC
DR21-1-4 : same as above, small fragment from the tube

SWIFT DR 22

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/09	41°40.50'E	42°37.40'S	3050
End	2001/03/09	41°39.30'E	42°37.70'S	2700

Photos: DR22.JPG ; DR22-3-5.JPG ; DR22-3-4.JPG ; DR22-3-3.JPG ; DR22-3-1.JPG ; DR22-2-2.JPG ; DR22-2-1.JPG ; DR22-1-8.JPG ; DR22-1-4.JPG ; DR22-1-3.JPG.

Site description: Off-axis elevated structure (up to 1600 m) on the western flanks of the Discovery fracture zone (about 20 Ma).The base of the flank was dredged in order to avoid the sedimentary cover.

MAPR: no.

Dredge (weight and rocks)

300 kg of blocks (up to 25 x 15 x10 cm) and small rock fragments.

Rock Type :

Type 1 : 30% sediments, greenish fine grained pelites.
Type 2 – 40% fine grained dolerites and gabbros.
Type 3 – 30% coarse grained locally clataclastic metagabbros, cross cut by numerous veins.

Samples description :

Type 1 : All fragments of sediments have been sampled. For nature and dating.
DR22-1-1 : Greenish pelites with crystal fragments (0,5 to 1 mm). No structures
Very thin (<1mm) white veins. No Mn coating. Slabs.
DR22-1-2 : as DR22-1-1 with black veins. Slabs.
DR22-1-3 : Sediments made of two parts.
- a greenish pelitic part, same as above (i.e. DR22-1-1 and DR22-1-2).
- a black brownish clastic part with elongated clasts up to 4 mm of very fine sedimentary material or highly altered basalt (interaformational reworking ?). Slabs.

DR22-1-4 : Similar to DR22-1-2, with 0.5 cm thick vein (white mineral = calcite ?). Slabs.
DR22-1-5 : as DR22-1-1 with 1-2 cm thick black veins. Slabs.
DR22-1-6 : Similar to DR22-1-2 (no slab).
DR22-1-7 : Similar to DR22-1-2. Slabs.
DR22-1-8 : Similar to DR22-1-2 with Mn dendrites . Slabs.
DR22-1-9 : Similar to DR22-1-2 (plus veins) with 1-2 mm thick white veins.
DR22-1-10 : volcanoclastic breccia

Type 2 : Fine grained olivine-gabbro
most of these rocks sampled by Michael
DR22-2-1 : Black microgabbro with pinkish bronzite and elongated oxides (noritic microgabbro) . Slabs.
DR22-2-2 : Microgabbro with plagioclase and pyroxenes (1 to 4 mm) containing a quartz vein. Slabs.
DR22-2-3 : Very fine grained microgabbro with plagioclase crystals (2 mm) in a dark microcrystalline matrix. Slabs.
DR22-2-4 : As above. Slabs.
DR22-2-5 : Large block (30 x 20 x 15 cm).
fine-grained microgabbro with a doleritic texture. Most probably a dyke. Slabs.
DR22-2-6 : Similar toDR22- 2-5, 15 x 10 x 5 cm. Slabs.
DR22-2-7 : Fine grained olivine gabbro (grain size = 0,5 cm) with a cumulate texture. Slabs.
DR22-2-8 : Fine grained olivine-rich gabbro.
DR22-2-9 : Dolerite, small block.
DR22-2-10 : Clinopyroxene-olivine (?) gabbro with altered olivine ; similar to 2-8.
DR22-2-11 : Dolerite.
DR22-2-12 : Dolerite
DR22-2-13 : Small block of very fresh gabbro.
DR22-2-14 : sSmall block of basalt ?
DR22-2-15 : sSmall block of dolerite.

DR22-2-16 : Altered gabbro.
DR22-2-17 : Altered gabbro or detrital breccia ?
DR22-2-18 : Fine grained gabbro.
DR22-2-19 : Small pegmatite pegmatite, with several cm feldpar crystals, and biotite.
DR22-2-20 : Altered basalt.
DR22-2-21 : Altered gabbro, with pyroxene crystals (or ultramafic ?).
DR22-2-22 : Fine grained gabbro.
DR22-2-23 : Basalt.
DR22-2-24 : Gabbro.
DR22-2-25 : Altered basalt.
DR22-2-26 : Basalt.

Type 3 : Cataclastic, coarse grained clinopyroxene-plagioclase metagabbros.
DR22-3-1 : coarse grained gabbro (30 x 20 x 20 cm), highly fractured and veined, covered by a 2 mm Mn crust. 0.2 - 5 mm thick veins filled with white minerals.
DR22-3-2 : Coarse grained gabbro (50 x 30 x 30 cm) one half more felsic covered by a 1 mm Mn crust (0.1-0.5 mm thick) veins with white filling. Slabs.
DR22-3-3 : Coarse grained cataclastic gabbro block (15 x 5 x 5 cm) highly deformed, no original mineral. Thick Mn crust : one small clast of sediment embedded in the Mn crust. Slabs.
DR22-3-4 : Coarse grained cataclastic gabbro (30 x 30 x 20 cm) covered by a 5 mm Mn crust. Overprinted by a foliation. Slabs.
DR22-3-5 : Coarse grained gabbro (20 x 20 x 10 cm) covered by a 2-3 mm Mn crust. Slabs.
DR22-3-6 : Small clast of gabbros. No slab.
DR22-3-7 : Cataclastic metagabbro. Slabs.

SWIFT DR 23

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/0	42°07.70'E	42°48.00'S	2900
End	2001/03/0	42°07.40'E	42°48.40'S	2800

Photos: DR23.JPG ; DR23-1-1.JPG.

Site description: Western flank of the highest structure (2780 m high) in the center of segment 8.

MAPR: no.
No tube attached to the dredge

Dredge (weight and rocks)

50kg of blocks, one big sample (> 25 kg) which had to be broken to extract from the dredge net, and aphyric pillow lavas.

Rock Type :

Type 1 : Aphyric basalt with Mn crust (rare pieces with fresh glass).

Sample description :

DR23-1-7 : Aphyric pillow lava fragments. Slabs.
DR23-1-8 : Aphyric pillow lava fragments. Slabs.
DR23-1-9 : Aphyric pillow lava fragments. Slabs.
DR23-1-10 : Aphyric pillow lava fragments. Slabs.
DR23-1-11 : Aphyric pillow lava fragments. Slabs.

Glass description :

Not very fresh – rare pieces are Ok. The total mass of glass numbered is about 220 g.
DR23-1-1g : Relatively fresh. Inside seems very fresh. Pieces with size between 1 to 2 cm. No crystals. About 45 g.
DR23-1-2g : Very thin pieces with a lot of Mn. Some areas are fresh. About 10 g.
DR23-1-3g : Not fresh on the surface but fresh inside. About 60 g.
DR23-1-4g : Same description as DR23-1-1g. The larger chunks are fresh inside. About 70 g.
DR23-1-5g. Not fresh. No crystals. About 10 g.
DR23-1-6 g : Small pieces of 3 x 3 x 2 cm. Very fresh inside. Mn on surface and some sediment on it. About 10 g.
DR23-1-7g : Some small pieces extracted from an aphyric pillow lava, very thin with Mn coating. About 15 g.

SWIFT DR 24

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/10	43°03.30'E	40°07.50'S	2780
End	2001/03/10	43°02.90'E	40°59.95'S	2200

Photos: DR24.JPG ; DR24-6-4.JPG ; DR24-4-6.JPG ; DR24-4-2.JPG.

Site description: Off-axis dredge in a ca. 40 Ma old oceanic crust, north part of the Discovery fracture zone. The dredge was on the north-eastern flanks of an elongated elevated ridge (up to 1050 m high) on the western side of the fracture zone.

MAPR: no.

Dredge (weight and rocks)

80 kg of basalts, basaltic breccias, peridotites, sediments, sedimentary breccias.

Rock Type :

Type 1 : 15% - altered basalts.
Type 2 : 10% - basaltic breccia coated by a thin Mn crust.
Type 3 : 20% - fine grained brownish sediment.
Type 4 : 25% - possible altered mylonitic harzburgites.
Type 5 : 30 % -coarse grained clastic breccia.
Type 6 : weirdos (a few pieces).

Sample description :

Type 1 :
sampled by Michael

DR24-1-1 : angular block of altered basalt - 25x12x10cm - Few percent of plagioclase phenocrysts.
DR24-1-2 : angular block of altered basalt (20 x 10 x 8 cm). Vesicles, up to 2 mm, filled. Occasional plagioclase phenocrysts.
DR24-1-3 : block (10 x 8 x 10 cm) of altered basalt, coarser grained.
DR24-1-4 : block of altered basalt, very fine-grained, scarce plagioclase phenocrysts.
DR24-1-5 : block of altered basalt, similar to 1-4 with a thick Mn crust on one side.
DR24-1-6 : block of altered basalt, fine-grained 1 mm sized vesicles (1%).
DR24-1-7 : small block of altered basalt. Microphenocrysts of plagioclase. Possibly secondary zeolites.
DR24-1-8 : small block of altered basalt.
DR24-1-9 : small block of altered basalt.
DR24-1-10 : small block of dolerite.
DR24-1-11 : small basalt fragment with scarce plagioclase phenocrysts.

Type 2 :

Breccia with basaltic clasts. The basalt clasts are altered and more purple than in type 1. They are cemented by a Mn crust

DR24-2-1 : block (12 x 10 x 10 cm).
DR24-2-2 : block (10 x 8 x 6 cm).

Type 3 :

DR24-3-1 : small block of fine grained sediment, brownish with some bedding.

Type 4

Angular samples, with flat parallel faces ; probably green to yellow mylonitic peridotites. In some samples, orthopyroxene is still visible.

DR24-4-1 : small block of possible mylonitic dunite. Slabs.
DR24-4-2 : idem (6 x 4 x 4 cm). Slabs.
DR24-4-3 : idem (15 x 12 x 6 cm). Slabs.
DR24-4-4 : idem, very small block. Slabs.
DR24-4-5 : idem, large block (25 x 20 x 15 cm). Slabs.

DR24-4-6 : altered mylonitic peridotite .
note : some samples labeled type 4 may actually be sediments (difficult to sort out).

Type 5

DR24-5-1 : large block of medium grained detrital breccia (25 x 20 x 15 cm); peridotitic clasts (generally 1 cm in size) .

Type 6

DR24-6-1 : altered undeformed peridotite (lot of crystals) (8 x 6 x 6 cm). Slabs.
DR24-6-2 : medium crystalline rock of unknown parentage. Small block.
DR24-6-3 : idem.
DR24-6-4 : small block, similar to DR24-6-1. Slabs.

SWIFT DR 25

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001/03/11	43°22.70'	40°59.7'	3350
End	2001/03/11	43°23.45'	40°59.95'	3280

Photos: DR25.JPG ; DR25-1-25a.JPG ; DR25-1-25a.JPG ; DR25-1-19a ; DR25-1-19.JPG.

Site description: highest structure (3300 m high) in the center of segment 9.

MAPR: no.

Dredge (weight and rocks)

100kg of aphyric pillow lavas fragments and sediments.

Tube : 5 kg of sediments togther with about 1.5 kg of chips of basaltic glass.

Rock Type :

Type 1 : aphyric pillow basalts with thin fresh glassy rims. Some with no Mn coating at all, some with minor Mn coating.

Sample description :

Type 1 :

DR25-1-1 : pillow fragment 20 x 20 x 10 cm, glassy rim about 2 mm, no Mn coating, aphyric.
DR25-1-1g : 10-15g, fresh glass with some pieces are more than 1cm.
DR25-1-1slab : 2 slabs.

DR25-1-2 : pillow fragment 30 x 30 x 20 cm, glassy rim about 2 mm, thin Mn coating, aphyric.

DR25-1-2g : 80g of beautiful fresh glass, pieces more than 1cm insize are frequent.
DR25-1-2slab : 3 slabs.

DR25-1-3
DR25-1-3g : Mix of big and small pieces of fresh glass.
DR25-1-3slab : 3 slabs.

DR25-1-4 : pillow fragment 10 x 15 x 10 cm, glassy rim about 2 mm, slight Mn coating, aphyric.
DR25-1-4 g: : Mix of big and small pieces of fresh glass.
DR25-1-4 :4 slabs.

DR25-1-5 pillow fragment 10 x 10 x 10 cm, glassy rim about 2 mm, slight Mn coating, aphyric.
DR25-1-5 :2g of glass with Mn trace
DR25-1-5 :3 slabs.

DR25-1-6 pillow fragment 10 x 10 x 10 cm, glassy rim about 2 mm, rare Mn coating, aphyric.
DR25-1-6 g. About 30 g of fresh glass, mostly larger than 1 cm.

DR25-1-7
DR25-1-7 g : About 40 g of fresh glass. Same size as DR25-1-6g.
DR25-1-7 : 4 slabs.

DR25-1-8
DR25-1-8g : 20 g of a very shiny glass (some trace of Mn).
DR25-1-8 : 3 slabs.

DR25-1-9
DR25-1-9g : Beautiful glass (trace of Mn). About 30 g.
DR25-1-9 : 3 slabs.

DR25-1-11
DR25-1-11 g : same description as DR25-1-9. Amount of glass about 20-25g.
DR25-1-11 : 3 slabs.

DR25-1-12
DR25-1-12 g : 5 g of glass. Not very fresh.
DR25-1-12 : 3 slabs.

DR25-1-13
DR25-1-13 g : 25 g of a very fresh glass. The size is up to 1 cm or more for one piece. Some traces of Mn coating the surfaces.

DR25-1-13 : 3 slabs.

DR25-1-14

DR25-1-14 g : 10 g of glass. The glass is not very fresh.

DR25-1-14 : 4 slabs.

DR25-1-15

DR25-1-15 g : < 5g. Not fresh. Some little pieces are fresh.

DR25-1-15 : 3 slabs.

DR25-1-16

DR25-1-16 g : Fresh glass with some Mn on the surfaces.

DR25-1-16 : 2-3 slabs.

DR25-1-17

DR25-1-17 g : About 1 g of small pieces about 2-3 mm. Fresh glass.

DR25-1-17 : 3 slabs.

DR25-1-18

DR25-1-18 g : 10 g of glass. Same description as DR25-1-7g.

DR25-1-18 : 4 slabs.

DR25-1-19 : One pillow selected because of multiple glassy rims (3 rims which are almost perpendicular to each others).

DR25-1-19a : top of the pillow : 10 g of fresh glass. DR25-1-19b : : perpendicular to sample 1-19a : > 5 g of fresh glass. DR25-1-19c : <5 g with trace of Mn.

A mixture of all the glasses (sapmles n° a, b and c) in a bag.

DR25-1-20 : Again this is a pillow with 2 glassy rims which are perpendicular.

DR25-1-20a : About 5 g of a very fresh glass. DR25-1-20b : About 1 g of a fresh glass (not so shiny). This sample seems older than sample 20a.

DR25-1-21 : pillow lava (15 x 5 x 5 cm). Mn coating on the surface but inside the Mn crust the glass is fresh. No slab. A bag with pieces from this pillow.

DR25-1-22 : Pillow (15 x 15 x 5 cm). No glass extracted.

DR25-1-23 : < 10 g of a fresh glass.

Samples 24 and 25 ?

DR25-1-26 : Small pillow (7 x 5 x 5 cm). Again 2 glassy margins have been sampled.

DR25-1-26b : fresh glass about < 1g. DR25-1-26b : < 10 g very fresh glass with large pieces.

SWIFT DR 26

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001-03-11	44°02.02'E	40°58.62°S	3170
End	2001-03-11	44°02.50'E	40°58.	3070

Photos: DR26.JPG ; DR26-3-1.JPG ; DR26-2-5.JPG ; DR26-2-4.JPG ; DR26-2-3.JPG ; DR26-2-2.JPG ; DR26-2-12.JPG ; DR26-2-11.JPG ; DR26-2-10.JPG ; DR26-2-1.JPG.

Site description : Western flank of a conical structure (300 m high) (which according to our very nice chief should be a volcano with a lava flow) in the deep part between segments 9 and 10.

MAPR: no.

Dredge (weight and rocks)

200 kg of altered basalts and peridotites.
Tube : Considerable amount of small chips of basaltic glass.
1 bag of washed fragments.
1 large bag of unwashed sediment + rocks - probably contains abundant glassy chips.
- 1.5 kg of glass station
- 5 kg of sediments and more little pieces of glass.

Rock Types :

Type 1 : 20% of altered basalts
Angular blocks of basalt, probably fragments of pillow lavas. Some samples show variolitic rim. The purple color is probably hematite, Mn staining but not actual Mn crust.
Type 2 : 80%
Altered harzburgites, genrerally yellowish. Abundant rounded orthopyroxenes (5 mm) (up to 40%). Exceptional dunites. Some serpentine veins.
Type 3 : a few pieces of particular samples, related to peridotites.

Sample description :

Type 1 :
DR26-1-1 : Large block with pillow rim (varioles) (20 x 12 x 10 cm).
DR26-1-2 : Small block, pillow rim.
DR26-1-3 : Block (15 x 10 x10 cm). No margin.
DR26-1-4 : Same as DR26-1-3 (12 x 8 x 8 cm).
DR26-1-5 : Little block, dolerite. Looks fresh (5 x 8 x 4 cm)
DR26-1-6 : Block, fine grained with vesicles, 1mm, filled with greenish material.
bright red staining (10 x 8 x 6 cm).
Type 2 :
DR26-2-1 : Block (12 x 1 x 8 cm) of highly serpentinized peridotite (greenish) with large parallel veins. Slabs.
DR26-2-2 :Large block (25 x 20 x 15 cm) of yellowish peridotite. Cross cut by thick serpentine veins. Slabs.
DR26-2-3 : Small block (12 x 10 x 8 cm), very rich in pyroxenes, more black. Slabs.
DR26-2-4 : Idem. (18 x 6 x 8 cm). Slabs.
DR26-2-5 : Idem. Slabs.
DR26-2-6 : Altered, yellowish dunite, broken up.
DR26-2-7 : Block (20 x 10 x 10 cm), pyroxene-rich yellowish peridotite. Slabs.
DR26-2-8 : Idem. Small block. Slabs for Michael.
DR26-2-9 : Idem. Large block.
DR26-2-10 : Idem. Large block (30 x 20 x 15 cm). Slabs.
DR26-2-11 : Idem. Large block (25 x 20 x 15 cm). Slabs.
DR26-2-12 : Small dunite block, altered, yellowish. Slabs.
Type 3 :
DR26-3-1 : Small white pebbles of white material : magnesite ? With the slabs.
DR26-3-2 : schistose serpentine.
DR26-3-3 : cavity in altered peridotite, filled with needle spahed crystals (zeolites ?)
stored in a box, with slabs.
DR26-3-4 : piece of altered peridotite, cut by 1cm thick veins filled with white material similar to DR26-3-3.

SWIFT DR 27

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001-03-12	44°28,75°E	41°02,25°S	3070
End	2001-03-12	44°28,95'°E	41°01,18'°S	2910

Photo: DR27.JPG, DR27-1-9.JPG, DR27-1-19.JPG, DR27-1-24.JPG, DR27-1-25.JPG, DR27-1-28.JPG, DR27-1-30.JPG, DR27-1-31.JPG

Site description: Southern flanks of a NE oriented ridge in the discontiuity between segments 9 and 10.

MAPR: no.

Dredge (weight and rocks)

150kg of altered peridotites with 3 pebbles of lithified sediments.
Tube : full of sediments, glassy fragments ; Mn coat and fragments of peridotites.

Rock Type :

Type 1 : 95%

Mostly blocks or pebbles of coarse-grained harzburgites, all surrounded by a Mn-crust. The proportion of orthopyroxene varies from 10 to 40% (they are rounded, 5 to 12 mm in size). Serpentinisation varies from 20 to 100%.

Type 2 : 5%

Sediments like baked breccia or clastic sediments.

Sample description :

Type 1 : Systematic sampling has been made on the most coherent samples (i.e. serpentinisation < 70%). Decomposed serpentinised peridotites have thus been rejected. No special description have been made sample by sample as they are all comparable, apart from the modal composition of orthopyroxene. No apparent mylonitic harburgites have been found.

DR27-1-1→39 : Harzburgite material.

DR27-1-1 slab : 2 slabs.
DR27-1-2 slab : 2 slabs.
DR27-1-3 slab : 2 slabs.
DR27-1-4 slab : 2 slabs.
DR27-1-5 slab : No slab.
DR27-1-6 slab : 2 slabs.
DR27-1-7 slab : 2 slabs.
DR27-1-8 slab : 2 slabs.
DR27-1-9 slab : 2 slabs.
DR27-1-10 slab : 2 slabs.
DR27-1-11 slab : 1 slabs.
DR27-1-12 slab : 2 slabs.
DR27-1-13 slab : 1 slabs.
DR27-1-14 slab : 4 slabs.
DR27-1-15 slab : 2 slabs.
DR27-1-16 slab : 3 slabs.
DR27-1-17 slab : 2 slabs.
DR27-1-18 slab : 2 slabs.
DR27-1-19 slab : 2 slabs.
DR27-1-20 slab : 2 slabs.
DR27-1-21 slab : 2 slabs.
DR27-1-22 slab : 4 slabs.
DR27-1-23 slab : 3 slabs.
DR27-1-24 slab : 2 slabs.
DR27-1-25 slab : 2 slabs.
DR27-1-26 slab : 2 slabs.
DR27-1-27 slab : 2 slabs.
DR27-1-28 slab : 3 slabs.

DR27-1-29 slab : 2 slabs.
DR27-1-30 slab : 3 slabs.
DR27-1-31 slab : 4 slabs.
DR27-1-32 slab : No slab.
DR27-1-33 slab : 4 slabs.
DR27-1-34 slab : 4 slabs.
DR27-1-35 slab : 5 slabs.
DR27-1-36 slab : 6 slabs.
DR27-1-37 slab : no slabs.
DR27-1-38 slab : 4 slabs.
DR27-1-39 slab : 3 slabs.

Type 2 :

DR27-2-1 : Lithified grey to greenish pelitic (?) sediment with harzburgitic clasts, up to 3 x 4 cm in size.

DR27-2-2 : Grey to greenish fine grained shale sediment-type with elongate block to grey sediments clasts (deformed ?).

SWIFT DR 27

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001-03-12	44°28,75°E	41°02,25°S	3070
End	2001-03-12	44°28,95'°E	41°01,18'°S	2910

Photo: DR27.JPG, DR27-1-9.JPG, DR27-1-19.JPG, DR27-1-24.JPG, DR27-1-25.JPG, DR27-1-28.JPG, DR27-1-30.JPG, DR27-1-31.JPG

Site description: Southern flanks of a NE oriented ridge in the discontiuity between segments 9 and 10.

MAPR: no.

Dredge (weight and rocks)

150kg of altered peridotites with 3 pebbles of lithified sediments.
Tube : full of sediments, glassy fragments ; Mn coat and fragments of peridotites.

Rock Type :

Type 1 : 95%

Mostly blocks or pebbles of coarse-grained harzburgites, all surrounded by a Mn-crust. The proportion of orthopyroxene varies from 10 to 40% (they are rounded, 5 to 12 mm in size). Serpentinisation varies from 20 to 100%.

Type 2 : 5%

Sediments like baked breccia or clastic sediments.

Sample description :

Type 1 : Systematic sampling has been made on the most coherent samples (i.e. serpentinisation < 70%). Decomposed serpentinised peridotites have thus been rejected. No special description have been made sample by sample as they are all comparable, apart from the modal composition of orthopyroxene. No apparent mylonitic harburgites have been found.

DR27-1-1→39 : Harzburgite material.

DR27-1-1 slab : 2 slabs.
DR27-1-2 slab : 2 slabs.
DR27-1-3 slab : 2 slabs.
DR27-1-4 slab : 2 slabs.
DR27-1-5 slab : No slab.
DR27-1-6 slab : 2 slabs.
DR27-1-7 slab : 2 slabs.
DR27-1-8 slab : 2 slabs.
DR27-1-9 slab : 2 slabs.
DR27-1-10 slab : 2 slabs.
DR27-1-11 slab : 1 slabs.
DR27-1-12 slab : 2 slabs.
DR27-1-13 slab : 1 slabs.
DR27-1-14 slab : 4 slabs.
DR27-1-15 slab : 2 slabs.
DR27-1-16 slab : 3 slabs.
DR27-1-17 slab : 2 slabs.
DR27-1-18 slab : 2 slabs.
DR27-1-19 slab : 2 slabs.
DR27-1-20 slab : 2 slabs.
DR27-1-21 slab : 2 slabs.
DR27-1-22 slab : 4 slabs.
DR27-1-23 slab : 3 slabs.
DR27-1-24 slab : 2 slabs.
DR27-1-25 slab : 2 slabs.
DR27-1-26 slab : 2 slabs.
DR27-1-27 slab : 2 slabs.
DR27-1-28 slab : 3 slabs.

DR27-1-29 slab : 2 slabs.
DR27-1-30 slab : 3 slabs.
DR27-1-31 slab : 4 slabs.
DR27-1-32 slab : No slab.
DR27-1-33 slab : 4 slabs.
DR27-1-34 slab : 4 slabs.
DR27-1-35 slab : 5 slabs.
DR27-1-36 slab : 6 slabs.
DR27-1-37 slab : no slabs.
DR27-1-38 slab : 4 slabs.
DR27-1-39 slab : 3 slabs.

Type 2 :

DR27-2-1 : Lithified grey to greenish pelitic (?) sediment with harzburgitic clasts, up to 3 x 4 cm in size.

DR27-2-2 : Grey to greenish fine grained shale sediment-type with elongate block to grey sediments clasts (deformed ?).

SWIFT DR 28

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001-03-16	47°05.50'E	38°46.20'S	3000
End	2001-03-16	47°04.95'E	38°46.65'S	2800

Photos: DR28 JPG ; DR28-type2 JPG ; DR28-1-1a JPG ; DR28-1-1b JPG.

Site description: Southern flank of an elongated ridge in the center of segment 13.

MAPR: no.

Dredge (weight and rocks)

30 kg of pillow lavas. 5 samples recovered, including 2 large pillows.
Tube : about 5 kg sediments and glass pieces. Several pieces (up to 4 cm) with fresh glass, Mn coat and plagioclase were recovered (100 g fresh glass).

Rock Type :

Type 1 : Pillow basalts, with abundant (25%) plagioclase phenocrysts, and very fresh glass rims with no Mn coating.

Type 2 : one small lava flow fragment, petrographically similar to type 1.

Sample description :

Type 1

DR28-1-1 : Complete basaltic pillow, radius about 25 cm (50 x 35 x 30 cm). Glass rim, about 4-10 mm, with minor Fe staining and some Mn crust. Abundant plagioclase phenocrysts (1-10 mm), about 25%, some euhedral, some resorbed: two populations, about 10% small (1-2 mm), and about 10% large (5-10 mm). Abundant vesicles, about 1-4 mm.

DR28-1-1glass: 1 bag of about 5 kg of altered glass with Mn coating. No very fresh glass. Rich in plagioclase.

DR28-1-2 : Complete basaltic pillow, radius about 25 cm (50 x 35 x 30 cm). Glass rim, about 2-3 mm, with minor Fe staining. Abundant plagioclase phenocrysts (1-10 mm), about 25%, some euhedral, some resorbed. Some vesicles, about 1-4 mm, variably distributed - i.e. slabs have none, but other parts of pillow have up to 10% vesicles.

DR28-1-2glass: 1 bag of about 550g of altered glass with Mn coating and plagioclase.

DR28-1-3 : Small pillow fragment (5 x 6 x 7 cm). Glass rim, about 1-2 mm, with no Mn coating. Abundant plagioclase phenocrysts (1-5 mm), about 20%, concentrated in glassy rim (interior is virtually aphyric, with occasional tiny < 1mm plagioclases ?). Rare vesicles, about 1-2 mm.

DR28-1-4 : Small pillow fragment (10 x 8 x 5 cm). Glass rim, about 1-2 mm, with no Mn coating. Abundant plagioclase phenocrysts (1-5 mm), about 20%, concentrated in glassy rim (interior - small 1mm plagioclase crystal, about 5%).

DR28-1-5 : Small pillow fragment, radius 5 cm. Glass rim, about 1-2 mm, with no Mn coating, but some Fe staining. Abundant plagioclase phenocrysts (1-5 mm), about 20%, concentrated in rim, but with some large 5 mm plagioclases in interior.

Type 2 :

DR28-2-1 : Small lava flow fragment (15 x 8 x 4 cm). Fresh glass in places about 1-2 mm, with minor Fe staining. Abundant plagioclase phenocrysts (1-10 mm), about 20%, euhedral to rounded. Some vesicles, about 1-2 mm.

DR28-2-1glass: 100g of relatively fresh glass with Mn coating and plagioclase. Glass is fresher than Type 1.

SWIFT DR 29

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001-03-16	47°22.30'E	38°45.20'S	3040
End	2001-03-16	47°22.10'E	38°45.20'S	2880

Photos: DR29 JPG DR 29-1-1 JPG ; DR29-1-2 JPG ; DR29-1-3 JPG ; DR29-2-1 JPG.

Site description: Western flank of the central high of segment 14 (elongated ridge).

MAPR: no.

Dredge (weight and rocks)

30 kg of pillow lavas. 5 samples recovered.
Tube : a lot of fresh glass (1 bag for the glass station with 300 g) mixed with sediments, foraminifera and Mn crust + larger pieces (number = 6 for four bags ; the two smallest samples [approx. 2 cm] have not been kept) of altered basalt without any glass rim.

Rock Type :

All samples are aphyric pillow lava with a high vesicularity (always > 5%).

Type 1 : Fragment of pillow lava, aphyric and with vesicles. The glassy rim looks older than Type 2 pillows (3 samples).

Type 2 : Fragment of pillow lava, aphyric and with vesicles. The glassy rim looks very fresh (1 sample).

Type 3 : Fragment of pillow lava, aphyric and with vesicles. No glass.

All recovered samples have been kept.

Sample description :

Type 1 :

DR29-1-1 : Fragment of a large pillow (25 x 15 x 20 cm), vesicles (5%), aphyric (less than 1% plagioclase phenocrysts) with a glassy rim (1 mm) that does not look perfectly fresh and has a very thin Mn coat. 3 Slabs.

DR29-1-2 : Fragment of a large pillow (25 x 15 x 20 cm), vesicles (5%), aphyric (less than 1% plagioclase phenocrysts) with a glassy rim (1 mm) that does not look perfectly fresh and very thin Mn coat. Slabs. Glass collected in the second large pillow.

DR29-1-3 : Fragment of a pillow (15 x 10 x 15 cm), vesicles (> 5%), aphyric (less than 1% plagioclase phenocrysts) with a glassy rim (1 mm) than does look quite fresh and very thin Mn coat. Slabs. Glass collected.

Type 2 :

DR29-2-13 : Fragment of a pillow (15 x 10 x 15 cm), vesicles (> 5%), aphyric (less than 1% plagioclase phenocrysts) with a glassy rim (1 mm) that looks quite fresh and has a very thin Mn coat. Slabs. Glass collected.

Type 3 :

DR29-3-1 : Fragment of an aphyric highly vesicular (>5%) pillow lava (10 x 5 x 5 cm). No glass rim.
DR29-3-2 : Fragment of an aphyric highly vesicular (>5%) pillow lava (5 x 3 x 2 cm). No glass rim.
DR29-3-3 : Fragment of an aphyric highly vesicular (>5%) pillow lava (8 x 7 x 5 cm). No glass rim.
DR29-3-4 : Fragment of an aphyric highly vesicular (>5%) pillow lava (15 x 5 x 5 cm). No glass rim.
DR29-3-5 : Fragment of an aphyric highly vesicular (>5%) pillow lava (15 x 10 x 10 cm). No glass rim.

Glass Description :

DR29-1-1 : 50g. The glass is not perfectly fresh but part of it can be used anyway. Several pieces bigger than 1 cm are present. Vesicles up to 0.5 mm are present.

DR29-1-2 : 130g. The glass is not perfectly fresh but part of it can be used anyway. Vesicles 1.0 to 1.5 mm are present.

DR29-2-1 : 130g. Fresher glass than Type 1 glass. Not all the glass is perfectly fresh. Abundant vesicles. Thin Mn coat.

SWIFT DR 30

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001-03-17	48°37.35'E	38°04.95'S	2760
End	2001-03-17	48°37.45'E	38°04.60'S	2590

Photos: DR 30 JPG, DR30a JPG, DR30b JPG, DR30c JPG, DR30-1-2 JPG, DR30-1-3 JPG, DR30-1-4 JPG, DR30-1-5 JPG, DR30-1-6 JPG, DR30-1-7 JPG, DR30-1-9 JPG.

Site description: Southern flank of a volcano (180m high) in the center of the segent 16.

MAPR: no.

Dredge (weight and rocks)

100 kg of sparsly phyric to aphyric basalts. Occasional olivines.
Tube : full of glass >5 kg, and a small amount of sediment.

Rock Type :

Only one type :

Type 1 : Aphric pieces of pillow lavas. 12 samples

Sample description :

Type 1 :

DR30-1-1 : Small pillow lava fragment (10 x 5 x 8 cm), a fresh glass rim (2 to 6 mm) covers the samples. Aphyric basalts. Rare (about 1 mm in size) vesicles. Fe staining on side and base, no Mn crust and no slabs taken.

DR30-1-2 : Aphyric pillow fragment (15 x 8 x 8 cm). Fresh glassy rim 5 mm in places. No Mn crust. Jointed so slab fall apart easily. Abundant vesicles from <1 to 3 mm.

DR30-1-3 : Parts of a lava (10 x 10 x 5 cm) Inflated surface on base. Glassy rim 3-5 mm. Some Mn coating and aphyric, one plagioclas phenocryst seen. Abundant veshicles up to 1mm.

DR30-1-4 : Pillow radius 8cm (15 x 16 x 10 cm). Very fresh glass rim, Virtually no Mn crust but some Fe oxidation. Occasional 1 mm vesicles and rare large about 5 mm plagioclases.

DR30-1-5 : Pillow fragment (20 x 12 x 8 cm). Very fresh glassy rim 3 mm. Some Mn coating. Aphyric with rare 5 mm rounded plagioclase.

DR30-1-6 : Pillow fragment (25 x 10 x 10 cm). Glassy rim 2-3 mm, very thin Mn coat. Aphyric. Abundant vesicles. Occasional large and rounded plagioclases.

DR30-1-7 : Pillow fragment (20 x 12 x 8 cm). Very fresh glass 3-4 mm. Slight Mn in cracks on glass surface. Aphyric. Some vesicles up to 2 mm.

DR30-1-8 : Aphyric pillow radius 10 cm. Thin glassy rim < 2 mm and very litle Mn coating. Jointed. No slabs taken.

DR30-1-9 : Pillow fragment (15 x 10 x 12 cm). 2 mm glassy rim, Aphyric. Some Fe staining inside. Occasional vesicles about 1 mm.

DR30-1-10 : Pillow fragment (10 x 5 x 5 cm). Thin glass rim about 1mm and very thin Mn coating. Aphyric. Abundant vesicles 0.1-2 mm.

DR30-1-11 : Aphyric pillow fragment (15 x 10 x10 cm). Glassy rim 1 to 2 mm. Abundant vesicles 1-3 mm. Occasional very thin Mn coat.

DR30-1-12 : Pillow fragment (30 x 20 x 20 cm). Very thin glass rim and looks older with very litle fresh glass. Thin Mn coating. Occasional large 5 mm plagioclases, not in rim but bottom.

Glass description :

Type 1 :

DR30-1-1 g : 15 g of very beautiful fresh glass with some big pieces up to 1cm.
DR30-1-2 g : 40 g of very beautiful fresh glass, pieces up to 1.5 cm.
DR30-1-3 g : 35 g of very beautiful fresh glass. No big pieces..
DR30-1-4 g : 300 g of very beautiful fresh glass, some pieces up to 2-3cm.
DR30-1-5 g : <5 g of fresh glass, pieces up to 1cm.
DR30-1-6 g : 6-8 g of very thin fresh glass, some nice pieces up to 0.5-0.6 cm.
DR30-1-7 g : 60-70 g of very thin fresh glass, thick nice pieces up to 1.5 cm.
DR30-1-8 g :<3 g of very fresh glass, some thick pieces up to 1cm.

DR30-1-9 g :<3 g of very fresh glass, some thick pieces up to 1cm.
DR30-1-10 g : 10-15 g of very fresh glass, some big pieces but most are small.
DR30-1-11 g : 10 g of very fresh glass, thin glassy rim.
DR30-1-12 g :Not nice glass with Mn coating.

SWIFT DR 31

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth (m)
Begin	2001-03-17	48°49.58	38°03.50	2770
End	2001-03-17	48°49.00	38°03.65	2690

Photo: /

Site description : Eastern flank of segment 16.

MAPR: no.

Dredge (weight and rocks)

Empty.

SWIFT DR 32

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001-03-17	48° 49.70’	38° 01.80’	2760
End	2001-03-17	48°49.40’	38°01.62’	2680

Photo : DR32 JPG ; DR32-1-1 JPG ; DR32-1-2 JPG.

Site description: Small high (100m) on the western flank of the segment 16.

MAPR: no.

Dredge (weight and rocks)

50 kg of aphyric pillow lavas.
Tube :
5 kg of fresh glass. Approximately 10 large chunks of glass have been stored in individual bags with no number.
1 bag glass station.1 bag sediment, rich in foraminifers.
1 pillow fragment (10 x 10 x 10 cm) plus 3 small fragments.

Rock Type :

Only one type :

Type 1 : aphyric pillow-lavas. Some still have a fresh glassy rim, up to 5 mm thick, others have no fresh glass left. Scarce veshicles (< 1 mm in diameter), rounded and empty, << 1% in abundance.

Sample description :

DR32-1-1 : large pillow-lava (radius 16cm) with thick (up to 5mm) glassy rim.
DR32-1-1 glass: 120g of fresh glass, beautiful big pieces.
DR32-1-1 slab:

DR32-1-2 : small fragment of pillow lava, thin glassy margin (2-3 mm).
DR32-1-2 glass:50g of fresh glass but thin glassy rim.
DR32-1-2 slab:

DR32-1-3 : large pillow lava (radius = 12 cm) with some remains of the glassy crust.
DR32-1-3 glass: 30g of fresh glass but thin glassy rim.
DR32-1-3 slab:

DR32-1-4 : small pillow fragment, with some glass.
DR32-1-4 glass: 10g of fresh glass but thin glassy rim.
DR32-1-4 slab:

DR32-1-5 : idem. No slab.
DR32-1-5 glass : 10g of fresh glass but thin glassy rim. Not a lot of exploitable material.

SWIFT DR 33

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001-03-17	49° 11.20’	37° 51.26’	3000
End	2001-03-17	49° 11.60’	37° 51.00’	2880

Photos : DR33 JPG ; DR 33a JPG ; DR33b JPG ; DR331-1 JPG ; DR33-1-3 JPG ; DR33-1-6 JPG ; DR33-1-7 JPG ; DR33-1-8 JPG ; DR33-1-9 JPG ; DR33-1-10 JPG.

Site description: Southern flank of a small high at (near the wall of the axial valley) at the western end of the segment 17.

MAPR: no.

Dredge (weight and rocks)

About 30 plagioclase phyric pillow fragments with very fresh glass rims - 75 kg.
Tube: full of glass, about 5 kg, with similar quantity of sediment. Several large fragments (about 3 x 3 x 3cm) of just glass were sampled separately.

Rock Type :

Only one type.

Type 1 : plagioclase phyric pillow fragments with very fresh glass rims.

Sample description :

DR33-1-1 : pillow fragment (20 x 15 x 10 cm). Glass rim, about 4 mm, with minor Mn crust. Some plagioclase phenocrysts (2-10 mm), about 5%.

DR33-1-1glass: 70 g of fresh glass with some plagioclase, thin glassy rim <2mm and so no big glass samples, a litle Mn coating.

DR33-1-2 : pillow fragment.

DR33-1-2glass: 160 g of fresh glass with some big pieces 1cm.

DR33-1-3 : pillow fragment (15 x 10 x 10 cm). Fresh glass rim, with some Mn coating in cracks. Plagioclase phenocrysts (2-10 mm), about 5%. No vesicles.

DR33-1-3glass: about 50 g with better glass than DR33-1-1 and 1-2.

DR33-1-4 : small pillow fragment (10 x 5 x 5 cm). Fresh glassy rim, about 3 mm, some Mn coating in cracks. Sparsely plagioclase phyric (2-10 mm), < 5%. No vesicles. NB no slabs cut.

DR33-1-4glass: about 40 g of fresh glass with sediments and Mn coat.

DR33-1-5 : pillow fragment (40 x 25 x 20 cm). Thin glass rim, about 1 mm, with occasional very thin Mn crust. Some plagioclase phenocrysts (1-15 mm), < 10 %, resorbed. Abundant tiny vesicles (< 1 mm).

DR33-1-5glass: 90 g of glass powder with Mn coat and plagioclase, no good quality of glass.

DR33-1-6 : small pillow fragment (5 x 8 x 10 cm). Very fresh glass rim, about 3 mm, with no Mn crust. Sparsely plagioclase phyric (2-5 mm), < 5 %, resorbed. No vesicles. 2 small slabs.

DR33-1-6glass: about 20 g of thin fresh glass.

DR33-1-7 : pillow fragment (15 x 30 x 15 cm). Thin glass rim, about 1 mm, with no Mn crust. Sparsely plagioclase phyric (2-5 mm), about 5%, resorbed. Abundant tiny vesicles (< 1 mm).

DR33-1-7glass: 25g of powder glass.

DR33-1-8 : pillow fragment (10 x 5 x 6 cm). Thin glass rim, about 1 mm, with no Mn crust. Sparsely plagioclase phyric (2-5 mm), <5%, resorbed, concentrated at rim. Abundant tiny vesicles (< 1 mm). 1 slab cut.

DR33-1-8glass: < 5 g of glass, not good quality.

DR33-1-9 : pillow fragment (12 x 8 x 6 cm). Thin glass rim, about 2 mm, with no Mn coating. Sparsely plagioclase phyric (2-8 mm), < 5 %, resorbed, concentrated at rim. Abundant tiny vesicles (< 1 mm).

DR33-1-9glass: 3g of powder glass.

DR33-1-10 : pillow fragment (15 x 10 x 5 cm). Thin glass rim, about 1 mm, with occasional very thin Mn crust. Some plagioclase phenocrysts (1-10 mm), <5%, resorbed,and only found in rim. Abundant tiny vesicles (< 1 mm).

DR33-1-10glass: 5g of no fresh glass powder.

DR33-1-11 to **DR33-1-16**: glassy margins cut off larger blocks.

SWIFT DR 34

	yyyy/mm/dd	Lon (°, ')	Lat (°, ')	Depth
Begin	2001-03-17	49° 17.66	37° 52.83	2750
End	2001-03-17	49° 17.20	37° 51,15	2670

Photos : DR34.JPG, DR34tube.jpg, DR 34-1-1 JPG ; DR34-1-1a JPG ; DR34-1-2 JPG ; DR34-1-2a JPG ; DR34-1-2b ; DR34-1-3 JPG ; DR34-1-5 JPG ; DR34-1-5b JPG ; DR34-1-6 JPG ; DR34-1-6a JPG ; DR34-1-6b JPG ; DR34-1-6c JPG ; DR34-1-8 JPG ; DR34-1-9 JPG ; DR34-2-1A JPG ; DR34-2-2 JPG ; DR34-2-3 JPG ; DR 34-2.

Site description: Southern flank of a small E-W oriented ridge in the center (E) of segment 17

MAPR: no.

Dredge (weight and rocks)

Dredge contains approximately 150 kg of basalt.
Tube: contains no sediment but does contain approximately 5 kg of glass-rich plagioclase phyric basalt. Two bags of matrial kept - one with larger pieces (5-15 cm), the other with smaller glassy fragments.

Rock Type :

Type 1 : plagioclase phyric basalt. Appears quite fresh (little obvious Mn coating, slight Fe staining in place) with glassy rinds up to 5-10 mm thick. In some samples plagioclase phenocrysts are concentrated at the chilled margin. Plagioclase abundance is between 5-10 % and phenocrysts range up to 2 cm in size. Very sparse olivine phenocrysts also apparent. Type 1 represented by both pillow fragments as well as fragments of lava tubes. The latter are generally sheet-like (< 5 cm thick) and curved and have a non-glassy chilled inner margin.

Type 2: plagioclase phyric basalt with two distinct glassy crusts. Consists of one large pillow and several smaller fragments. Strong concentration of plagioclase in chilled margins in these samples, overall 1-5% plagioclase.

Sample description :

Type 1: (glass and slabbed surfaces taken for all samples except where noted).

DR 34-1-1 : Large lava tube fragment (30 x 20 cm). Glass on exterior surface. Plagioclase phyric (~10 %), interior less plagioclase rich than chilled outer surface.
DR34-1-1glass :25 g of powder glass with plagioclase.

DR 34-1-2 : Pillow fragment (40 x 20 cm). Glassy exterior. Plagioclase phyric (~10%). Interior is less plagioclase rich (< 5 %).
DR34-1-2 glass : 110 g of fresh powder of glass, beautiful glass with some big pieces 0.5 cm.

DR 34-1-3 : Pillow fragment (30 x 30 cm). Plagioclase phyric (~10%) with less plagioclase rich interior. Glassy exterior.
DR34-1-3glass : 50 g of fine powder with altered plagioclase.

DR 34-1-4 : Pillow fragment (20 x 20 cm). Plagioclase phyric (~10%) with less plagioclase rich interior. Glassy exterior.
DR34-1-4 glass : 40 g of glass with altered plagioclase.

DR 34-1-5 : Lava tube fragment (20 x 10 cm, 5 cm thick). Plagioclase phyric (~10%). Interior slightly less plagioclase rich than outer margin.
DR34-1-5 glass : 15 g of glass with altered plagioclase.

DR 34-1-6 : Small pillow fragment (10 x 10 cm). Plagioclase phyric (~10%) with glassy exterior.
DR34-1-6 glass : 5 g of fresh glass, nicer than the others samples and altered plagioclase.

DR 34-1-7 : Small glass-rich pillow fragments (3, less than 10cm). Plagioclase-phyric (~10%). No slab - too small.
DR34-1-7 glass : 5 g of fresh glass, nicer than the others samples and altered plagioclase.

DR 34-1-8 : Pillow fragment (10 x 10 cm). Plagioclase phyric (~10%) with glassy exterior. DR34-1-8 glass : <5 g of powder glass with plagioclase and Mn coat.

DR 34 -1-9 :Pillow fragment (10 x 10 cm). Plagioclase phyric (~10%) with glassy exterior. DR34-1-9 glass : <2 g of not nice glass with plagioclase.

One bag of small type 1 samples also kept. Consists of plagioclase phyric lava tube and pillow fragments with some glass.

Type 2:

DR 34-2-1 :Large pillow fragment (50 x 40 cm) with two distinct glassy cooling surfaces. The outer lava is plagioclase phyric (~ 5 %) with lesser plagioclase in the interior. This material is 10-15 cm thick and overlies more glassy material. The underlying lava is also plagioclase phyric and is ~25 cm thick. The glass-rich crust is plagioclase rich ~10-15% and the interior has less plagioclase (< 5 %). Glass material was sampled from both glassy layers.

DR34-2-1A outer glass : 100 g of fresh glass with nice big pieces, trace of Mn coat and rich in plagioclase.

DR34-2-1B inner glass : 60-70 g of beautiful fresh glass with plagioclase and Mn coat, nicer than DR34-2-1A.

DR 34-2-2 : Pillow fragment (20 x 10 cm) with two glassy crusts. Plagioclase phyric with plagioclase concentrated on the outer glassy portions. Slightly Fe-stained in parts. Glass only taken from outer surface.

DR34-2-2 glass: <10 g of altterd powder glass.

DR 34-2-3 : Two small pillow fragments (both less than 10 cm). Some glassy material on exterior but not enough for seperate glass sample to be taken. Both fragments are glass-rich on the surface and almost aphyric in the centre.

Rock Core description

RC01 : Heavy rock core. 2 different pieces of about 10cm (weight : 100g, 2 times 50g). Some are very fresh, Mn and oxydation. All analysis can be done.
RC01g : glass of above.
RC01s : 2 slabs of above.

RC02 : About 1g. Some pieces are very fresh. No crystals. Some sediment color n°=16. Major and probably trace elements.

RC03 : Parafin wax and little pieces of glass are present <0.05g, and 2 bags of sediments.
RC03-1 : (3g) Fresh glasses are present, and some pieces are about 0.3-0.4g
RC03-1 : little pieces altered <0.1g.

RC04 : Almost nothing, one or two pieces seem to be fresh (about 1mm). Microprobe for major element.

RC05 : Parafin wax and sediments are present (about 1g of glass). Little pieces of glass.

RC06 : Little pieces of glass on the parafin wax (0.2g). 1g of fresh glass (pieces of about 0.2-0.25g). glass in all heads. Trace of sediments.

RC07 : About 1-2g. Some pieces are fresh. Others pieces with Mn. Almost no sediment.

RC08 : Little pieces of glass on the parafin wax, and 1 bag of sediments. 4 bags of fresh glass (10g) with on big piece 1.3-1.4g. Nice glass. 6 or 7 samples have a weight >0.4g.

RC09 : About 40g. Small pieces are fresh. Sediment mixed with glass. Very shiny. Major and Trace and isotopes.

RC10 : About 40g of glass (quite fresh). Enough for Major and trace elements and isotopic ratios. Trace of sediments. 5 heads and some stuck between the heads.

RC11 : About 2g. Small pieces are very fresh. Other pieces with Mn. Almost no sediments.

RC12 : Almost no glass. A couple of little pieces of about 2 mm. Sediment. Microprobe for major element (less than 0.1 g).

RC13 : Very little glass in this rock core. Some very small pieces are fresh (microprobe for major element but difficult for trace and REE). Plagioclase crystals (seems altered). About < 1g.

RC14 : Empty

RC15 : 1.5g total of fresh glass in this rock core, with some big pieces (≈ > 1-2mm). One big piece 0.6cm.
Head 1 : 4 beautiful pieces of glass (250mg)
Head 2 : some little pieces of glass (100mg)
Head 3 : some little pieces of glass (400mg)
Head 4 : some little pieces of glass (250mg)
Head 5 : some little pieces of glass (100mg)
Vrac : some big pieces of glass (500mg)

Off-axis Dredges (Madagascar Plateau and off-axis SWIR)

SWIFT had two main off-axis objectives. The first objective was to recover the first basement samples of the Madagascar Plateau, a major feature of the Southwest Indian Ocean which extends between 26°S and 35°S. Because the basement had not been sampled prior to SWIFT there is speculation about whether the plateau is continental or oceanic. SWIFT aimed to clarify the origin of the plateau and its relationship to the Marion hotspot and the anomalous low $^{206}Pb/^{204}Pb$ segment (39°E-41°E) of the SWIR between the Eric Simpson and Discovery II Fracture Zones.

The western flank of the Madagascar Plateau is relatively steep and appears to be fault bounded. It offered the best opportunity to locate suitable dredging targets, which was anticipated to be difficult because of the thick sedimentary cover. The bathymetric map of the first location DR MP01 (43°01.40'E, 30°52.40'S) on the western flank of the central-south Madagascar Plateau showed two prominent N-S trending fault escarpments. Dredging of the escarpments was carried out between 2600-2150m. The dredge consisted of 800 kg of limestone and about 5 kg of altered, plagioclase-phyric pillow basalts. Two types of limestone were identified, and they were present in approximately equal amounts. Type 1 consisted of a Mn stained yellow to light brown coloured limestone with traces of organic matter (wood fragments) and also possibly detrital grains. Type 2 was a purer, cream coloured, limestone. The third lithology recovered from DR MP 01 consisted of fragments of altered, plagioclase phyric, fine grained pillow basalts, with thin (~1 mm) manganese coating. One sample (MP 01-3-1) shows a chilled pillow margin consisting of altered glass. The basalt matrix ranges in colour from red-brown (hematite stained) to medium grey, and is cut by numerous smectite filled fractures. Plagioclase phenocrysts make up about 5% of the rock and are up to 5 mm in length. Small amounts (<1%) of clinopyroxene phenocrysts (1 mm) are also probably present.

A second dredge was attempted further south on the western flank of the plateau (DR MP02) but was empty.

The second off-axis objective of SWIFT was to study the time evolution of the anomalous low $^{206}Pb/^{204}Pb$ segment (39°E-41°E) of the SWIR, by sampling basalts and intrusive rocks along a single mantle flow line. Three dredge targets on approximately 10 Ma, 20 Ma and 40 Ma crust were chosen from the Discovery II Fracture Zone.

DR 21 was located on c.10Ma crust on the flanks of the western wall of the western branch of the Discovery II fracture zone (41°29.30'E 43°23.10'S). Dredging was carried out in an WNW direction, between 2600-2150m, up the eastern wall of a bathymetric high. The dredge consisted of 1 kg of blocks of near aphyric, altered pillow basalts (Type 1). Small, smectite filled vesicles and rare plagioclase phenocrysts were also present. A small polished pebble of pinkish quartzite, presumed to be a dropstone, was also recovered from the dredge.

DR 22 was located on c.20Ma crust on the flanks of the western wall of the western branch of the Discovery II fracture zone (41°40.50'E 42°37.40'S). Dredging was carried out in a WSW direction between 3050-2700m up the eastern wall of a bathymetric high (up to 1600m). The dredge returned 300 kg of material consisting of three lithologies. Type 1 made up 30% of the dredge and consisted of green-coloured pelites containing small crystal fragments (< 1mm) and occasional veins of calcite (?) and a black-coloured smectite. One sample (DR22-1-10) was interpreted as a volcanoclastic breccia. Type 2 made up 40% of the dredge and consisted of fine to medium grained dolerites and microgabbros, as well as a small piece of a gabbro pegmatite and several possible examples of basalt (DR22-2-14, -20). Samples DR22-2-5, -6, -9, -11, -12 and -15 have a typical dolerite texture and are most likely dykes. The microgabbros show a range in composition from olivine-rich to bronzite rich (norite) varieties. Mineral layering is visible in the bronzite-bearing noritic microgabbro DR22-2-1. A small pegmatite sample (DR22-2-19) with several cm feldspar crystals, and biotite was also recovered. Type 3 made up 30% of the dredge and consisted of coarse grained, locally clataclastic, clinopyroxene-plagioclase metagabbros, cross cut by numerous veins.

DR 24 was located on c.40Ma crust on the flanks of the western wall of the Discovery II fracture zone (43°03.30' 40°07.50'S). Dredging was carried out in a northerly direction between 2780-2200m on the north-eastern flanks of an elongated ridge (up to 1050m). The dredge returned 80 kg of rocks consisting of sediments, basalts, breccias and possible harzburgites and periodites. The material was grouped into six types. Type 1 made up 15% of the dredge and consisted of Mn-coated, altered basalts, occasionally vesicular and with a few percent of plagioclase phenocrysts. Celadonite and possible zeolites infill cavities in sample DR24-1-7. Type 2 made up 10% of the dredge and consisted of a Mn-coated basaltic breccia (hyaloclastite?). The basalt clasts have a purple-brown colour and range in size from a few millimeters to

several centimeters. The basalt is aphyric and very fine grained. Type 3 made up 20% of the dredge and consisted of a brown, fine grained sediment with some bedding visible. Type 4 samples made up 25% of the dredge and were difficult to interpret. The samples had a green to yellow colour and were typically angular, with flat parallel faces. In some cases, orthopyroxene was still visible and these samples were thought to be probably mylonitic peridotites, but others from this group may be sediments. Type 5 samples (30%) consisted of a medium grained detrital breccia with peridotite clasts up to 1 cm in size. Type 6 samples (<1%) are medium grained crystalline rocks, possibly with fresh olivine (DR24-6-1), and may be recrystallized peridotite.

PMEL MAPR

Two autonomous PMEL MAPRs (serial Numbers 5 and 8) were delivered to the Marion Dufresne, together with spare parts and batteries. A spare nephelometer in the packing box was not included in the shipment at destination. The MAPR records temperature, pressure (depth), and nephelometry (Figure 1) at a minimum rate of 5 s.

Communication with the MAPR and download of data is done via the MAPRTerminal program provided by PMEL. An Excel macro is also provided to read the raw data into actual T, depth and voltage of nephelometry.

Installation on the dredge. The MAPR is clamped to the dredge cable ~15 m above the pinger, which in turn is located 250 m from the ballast and 320 m from the dredge.

Installation on rock corer. The MAPR is clamped to the rock core cable ~15 m above the pinger.

A hydrtohermal plume was identified with MAPR 05 in the first cast (Figures 1-4). This MAPR was lost on the second cast, together with cable, pinger, and the dredge. MAPR 08 was succesfully deployed in two rock cores (01 and 02, Figure 5), where no plumes were detected. During DR04 MAPR 08 was damaged, the LBSS-MAPR cable came loose, and water reached the connectors (Figure 6). After tests in the lab showing that the connector may have been corroded, this was confirmed during DR 09 (Figure 6). Due to the lack of spare LBSS and connectors, the remaining MAPR 08 was not used during the rest of the cruise.

DR01:
The MAPR was succesfully deployed during DR01, where a possible plume signature was identified (Figure 2-4). The plume was situated ~600 m above the seafloor, and was sampled both during the way down (Figure 2) and up (Figure 3) of the MAPR. Turbulence observed during dredging (Figure 4) may cause the high turbidity in Figure 4.

DR02:
The MAPR 05 was lost together with the pinger, dredge and cable.

RC 01 & 02
The MAPR was deployed succesfully in rock cores 1 and 2. No plume signature was found (Figure 5).

DR04
Due to the loss of pinger, the MAPR was installed on the cable, without a pinger, 400 m above the dredge. At its recovery, the arm holding the nephelometer was detached from the

pressure case, with the bolts lost. The cable connecting the LBSS to the MAPR was loose at both ends, with water on the connector (Figure 6).

Connector pins were carefully cleaned, the cable replaced, and the MAPR re-mounted for redeployment. Tests on the lab did indicate that the output of the LBSS was not correct; normal values with the cap on before DR04 yielded voltages of ~5V, but we obtained voltages of 1-3 V, changing in a non-systematic manner afterwards.

DR09

Data from DR09 confirmed that the nephelometer was not in proper working condition, probably to corrosion by seawater of the pins within the connectors. Figure 6 shows the scatter over 6V of the nephelometer signal, while normal deep water values are <<0.5 V (Figure 5).

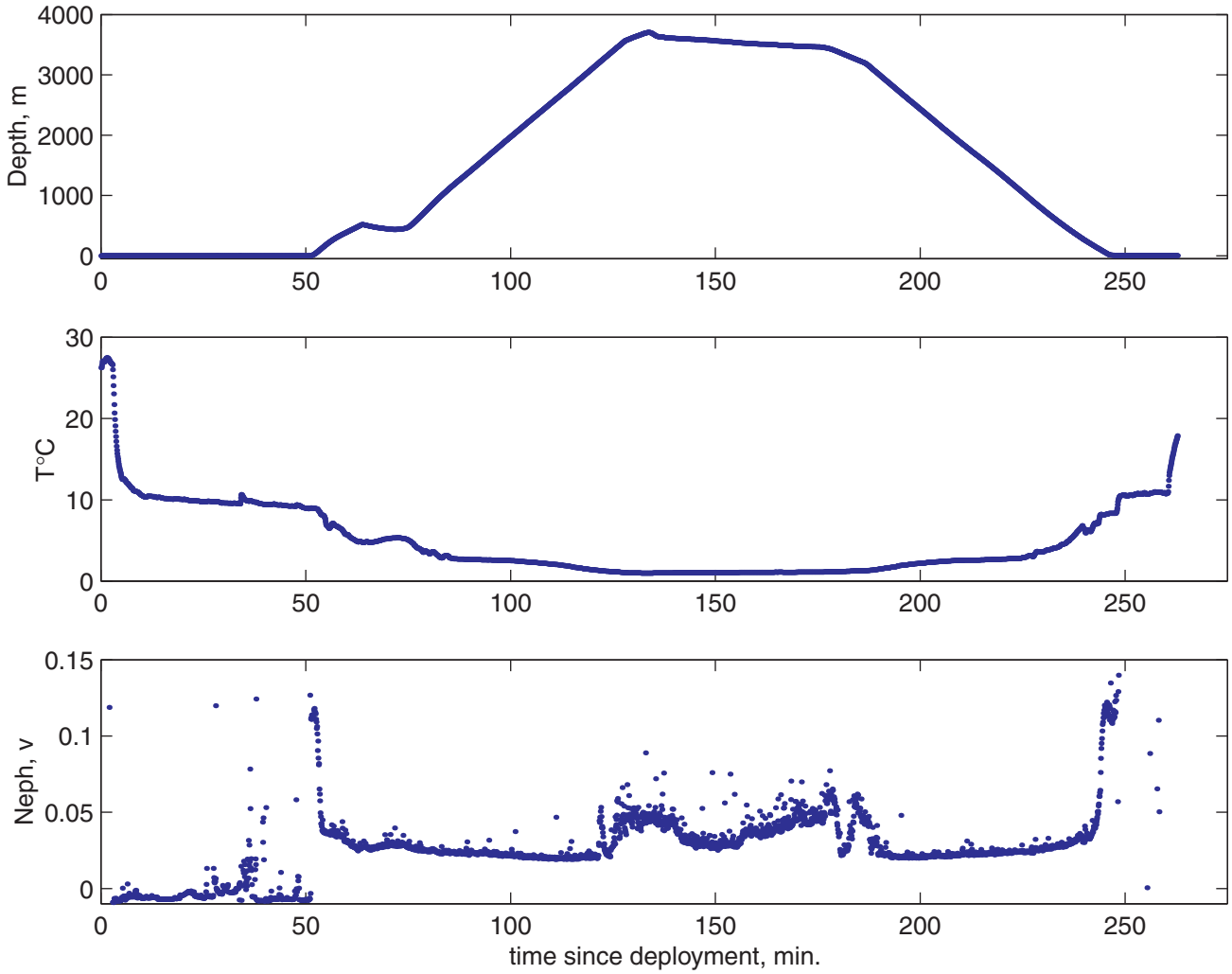


Figure 1: Record of depth (from pressure), temperature and nephelometry vs. time during DR01.

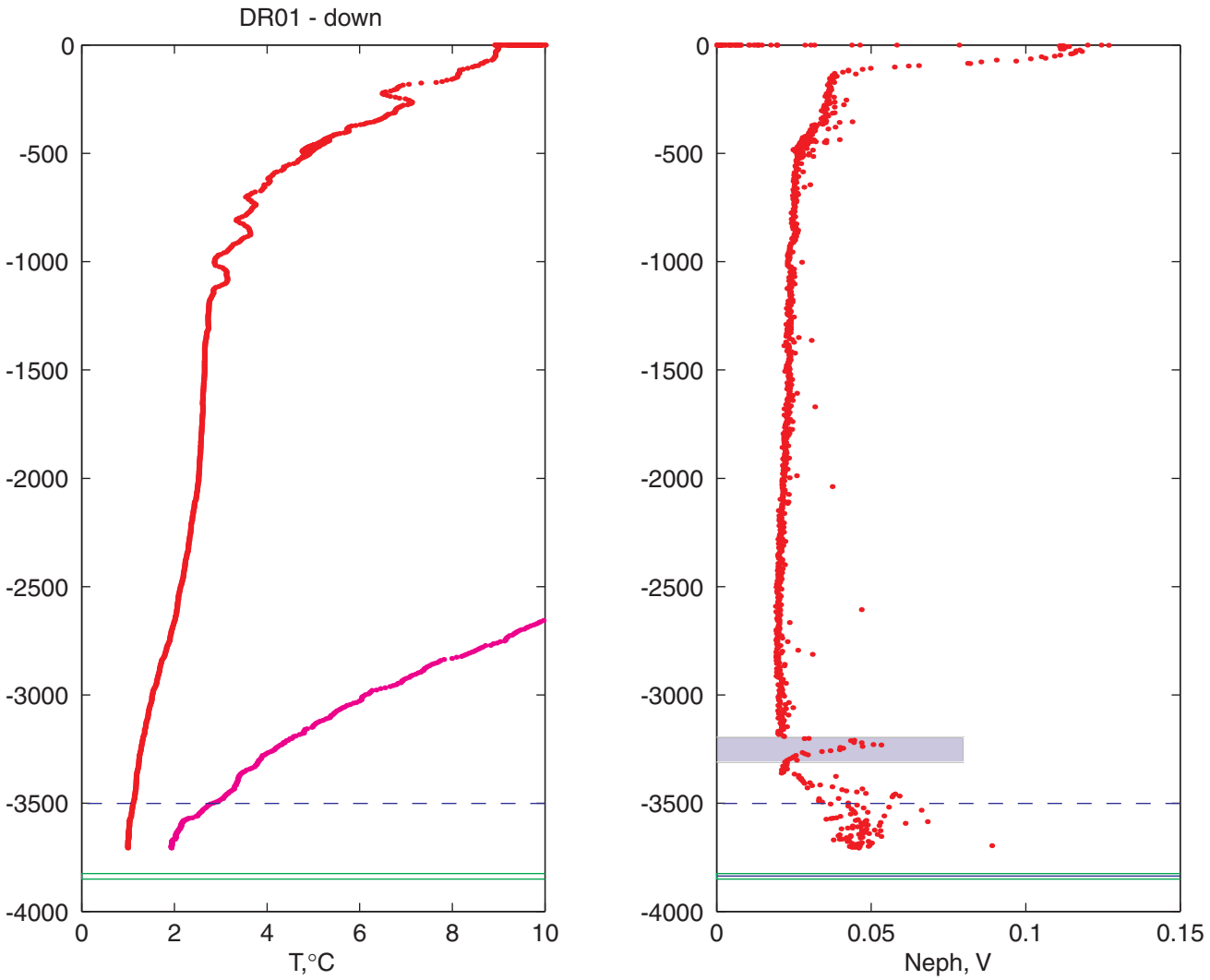


Figure 2. Record of T (left - red:normal scale, magenta, expanded scale) and nephelometry (right) during downcast ot DR01. The bottom is indicated by the solid line. The dashed line is 335 m above the bottom. The dredge should be in the water above this line, and therefore no turbulence associated with dredging should be recorded. A clear peak in nephelometry at ~600 m is observed (grey box)

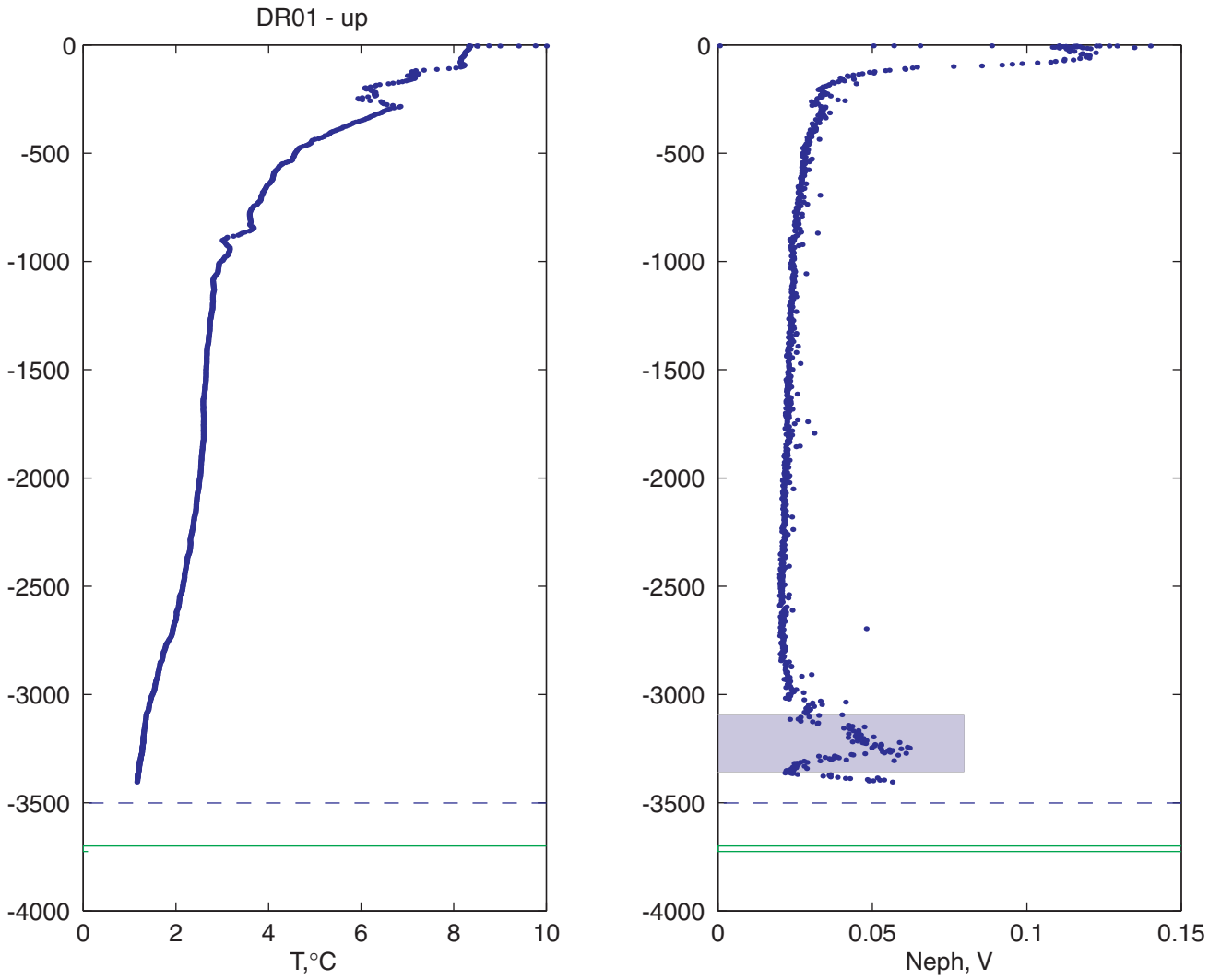


Figure 3. Record of T and nephelometry during recovery of DR01. The possible plume signal observed in the downcast (Figure 2) is also observed.

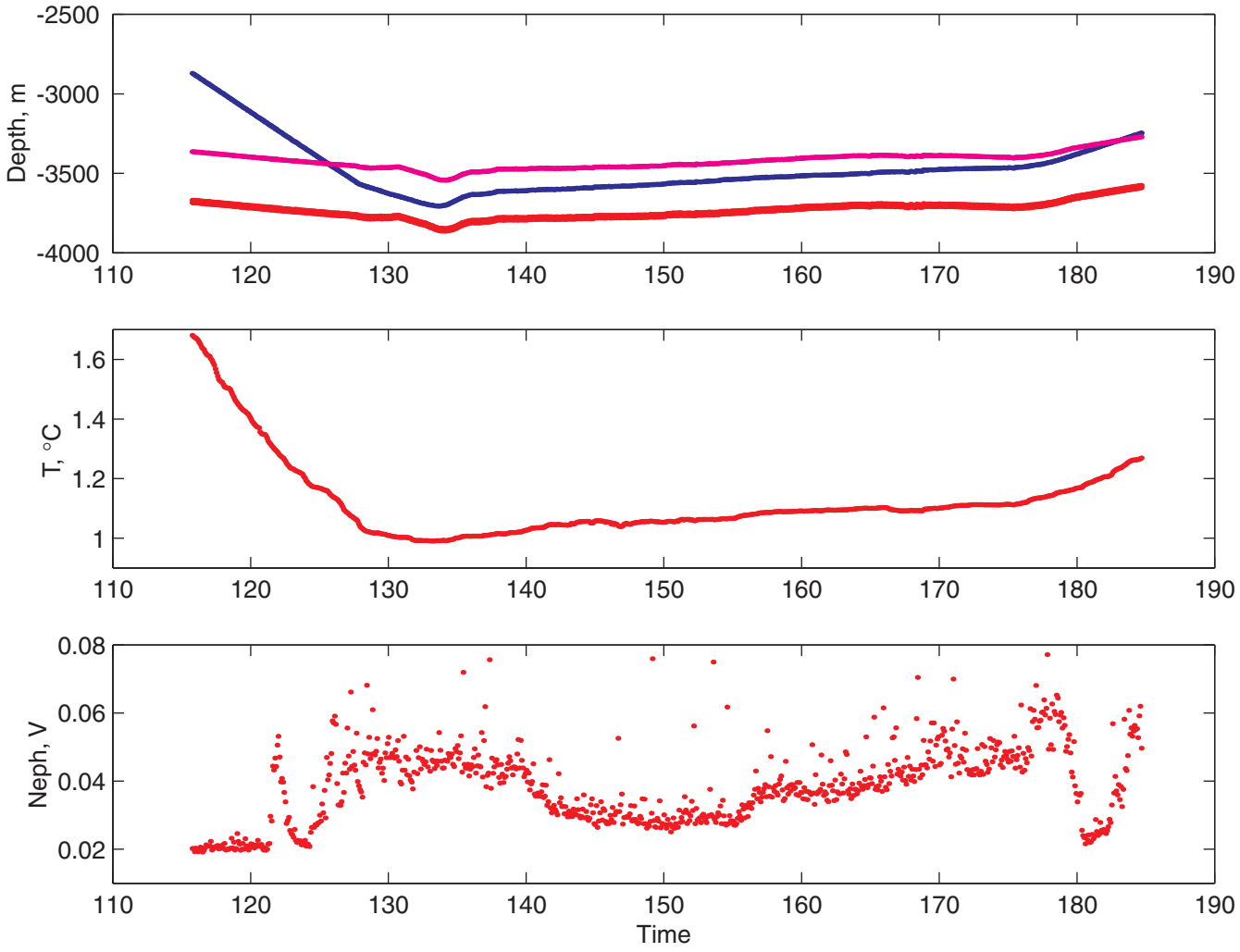


Figure 4. Top: Possible trajectory of the MAPR during DR01 dredging (blue: MAPR; red: bottom; magenta: 320 m above the bottom). Middle: T record. Bottom: Nephelometry. The turbidity recorded by the MAPR may be associated with turbulence generated by the dredge during its operation

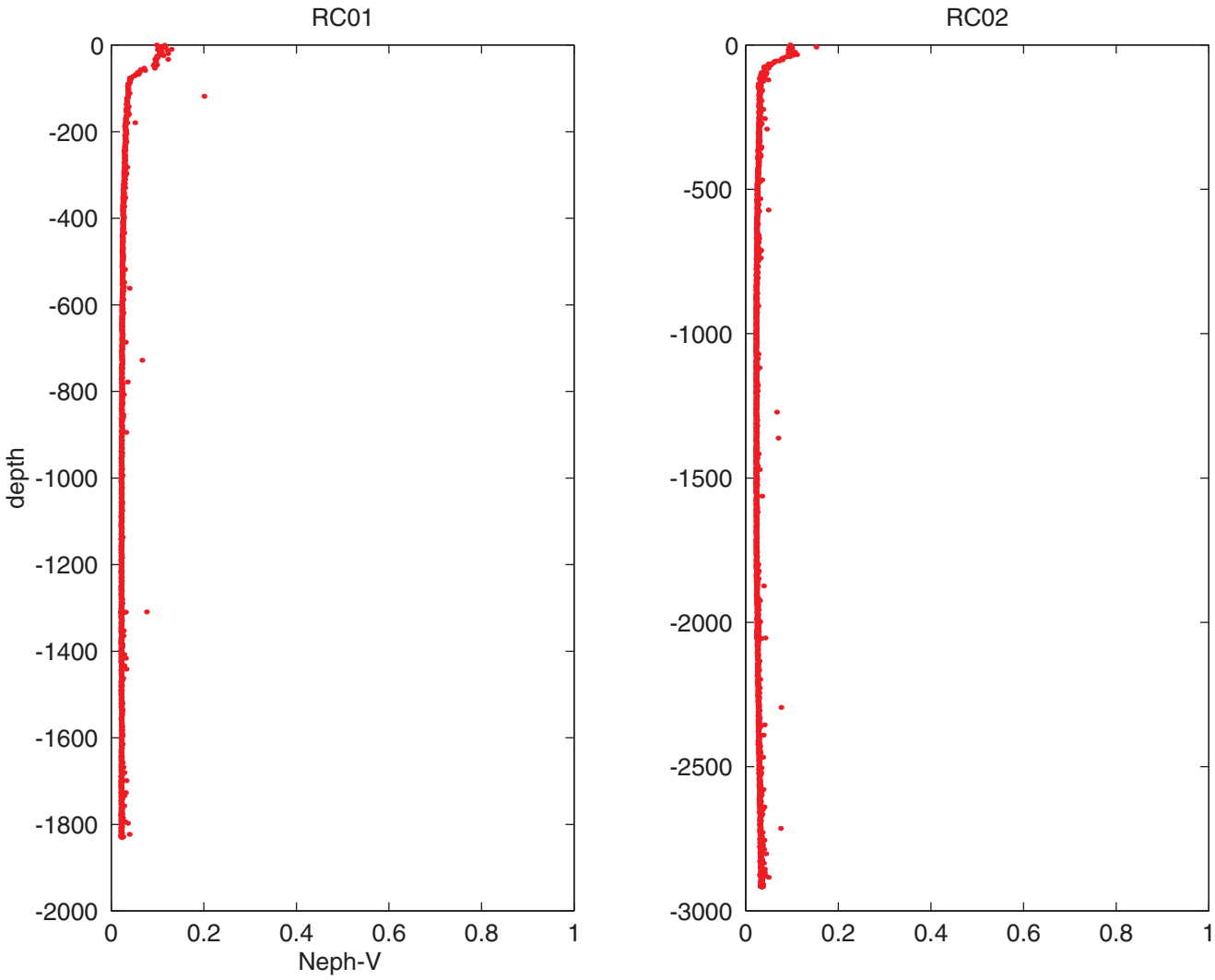


Figure 5. Nephelometry during RD01 and RC02. No plume is detected.

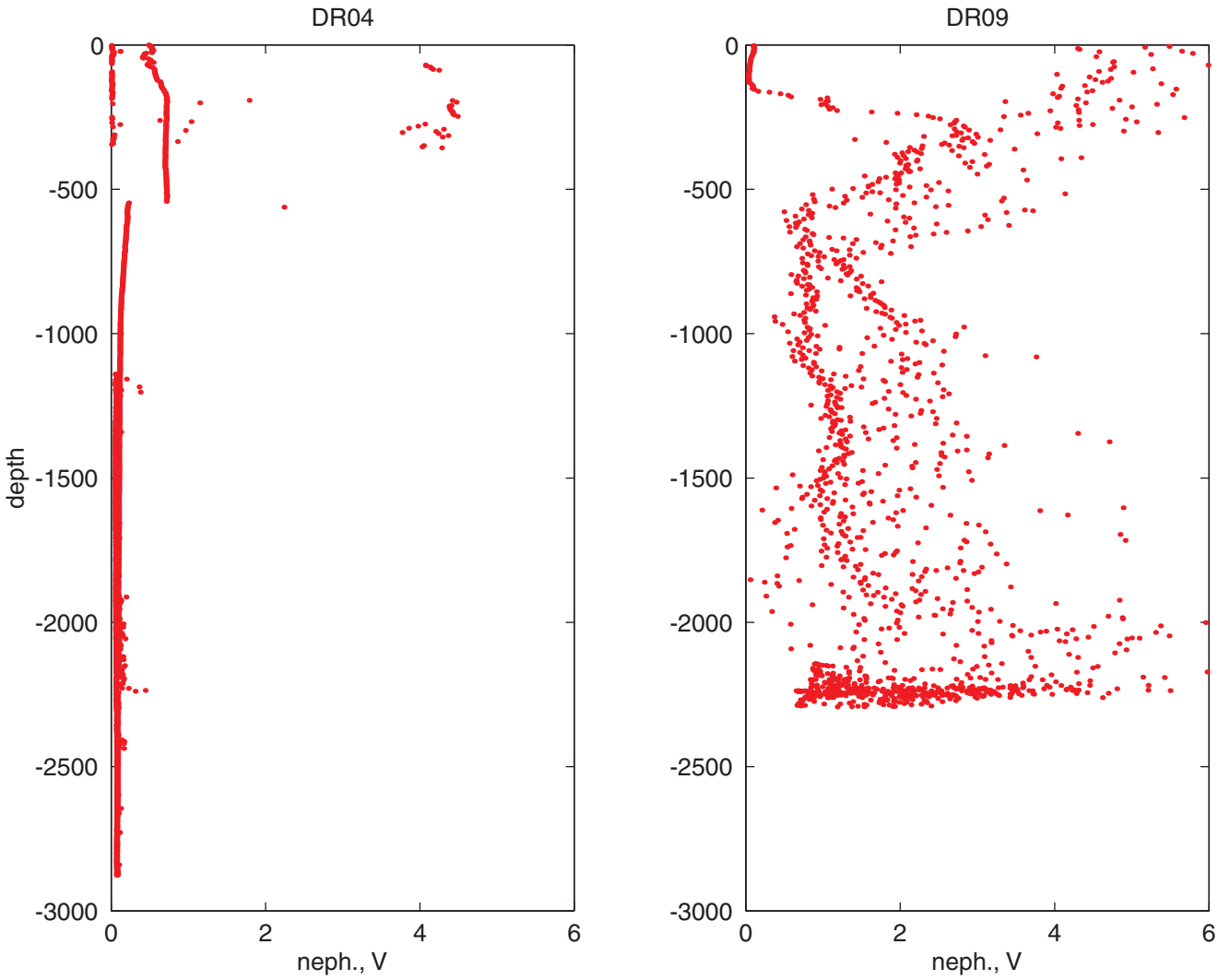


Figure 6. DR04: Failure of MAPR08, as observed by the sudden shift at 500 m of the nephelometry. DR09: Noise in the nephelometer channel, probably associated with corrosion of connector pins by seawater.

MAPR SWIFT DR 01

MAPR Serial Number 05 New batteries - No

DEPLOYMENT

	yyyy/mm/dd	Hh:mm	Lon ship	Lat ship	Depth ship	Lon DR/CR	Lat DR/CR	Depth DR/CR
PROGRAMMED	2001 02 28	13 42	----------	----------	----------	----------	----------	----------
IN WATER		14 39	32 30.64	47 07.93	4000			
DR/RC @ BOTTOM		16 02	32 34.26	47 07.94	3700	32-32.6	47 07.94	3860
END (take off)		16 43	32 35.81	47 07 68	3590	32 33.9	47 07.75	3760
ON DECK		17.56	----------	----------	----------	----------	----------	----------

DOWNLAD OF DATA

	yyyy/mmm/ddd	Hh:mm
MAPR CLOCK		18 12 24
SHIP'S CLOCK		18 12 39
RUN TIME	----------	04 30
CUM. RUN TIME	----------	06 00

DATA DOWNLOAD	DR01.DAT
NO. BLOCKS	22
CUM. NO. BLOCKS	26

15:28 Dredge at bottom
15:05 MAPR at lowest point

MAPR SWIFT DR 02

MAPR Serial Number 05 New batteries - No

DEPLOYMENT

	yyyy/mm/dd	Hh:mm	Lon ship	Lat ship	Depth ship	Lon DR/CR	Lat DR/CR	Depth DR/CR
PROGRAMMED	2001 02 28	20 41	----------	----------	----------	----------	----------	----------
IN WATER		21 18	32 51.04	47 10.63	2900/2300!			
DR/RC @ BOTTOM		22 16	32 49.48	47 09.64	2800			
END (take off)		23 06	LOST					
ON DECK			----------	----------	----------	----------	----------	----------

DOWNLAD OF DATA

	yyyy/mmm/ddd	Hh:mm
MAPR CLOCK		
SHIP'S CLOCK		
RUN TIME	----------	
CUM. RUN TIME	----------	

DATA DOWNLOAD	
NO. BLOCKS	
CUM. NO. BLOCKS	

Dredge Lost with cable MAPR pinger etc

MAPR SWIFT RC 01

MAPR Serial Number 08 New batteries - No LSBB 376

DEPLOYMENT

	yyyy/mm/dd	Hh:mm	Lon ship	Lat ship	Depth ship	Lon DR/CR	Lat DR/CR	Depth DR/CR
PROGRAMMED	2001 03 01	17 45	----------	----------	----------	----------	----------	----------
IN WATER		18 36	34 14.07	46 03.47	2000			
DR/RC @ BOTTOM		19 17	34 14.11	46 03.45	1960			
END (take off)		19 18	34 14.11	46 03.45	19600			
ON DECK		19 57	----------	----------	----------	----------	----------	----------

DOWNLAD OF DATA

	yyyy/mmm/ddd	Hh:mm
MAPR CLOCK		20 06 43
SHIP'S CLOCK		20 05 31
RUN TIME	----------	02:25
CUM. RUN TIME	----------	03:55

DATA DOWNLOAD	MAPR SWIFT DR 01.DAT
NO. BLOCKS	11
CUM. NO. BLOCKS	15

Touch bottom w/ 2021 m of cable

MAPR SWIFT RC 02

MAPR Serial Number 08 New batteries - No LSBB 376

DEPLOYMENT

	yyyy/mm/dd	Hh:mm	Lon ship	Lat ship	Depth ship	Lon DR/CR	Lat DR/CR	Depth DR/CR
PROGRAMMED	2001 03 03	05 10	----------	----------	----------	----------	----------	----------
IN WATER		05 37 30	37 02.17	44 40.4000	3008			
DR/RC @ BOTTOM		06 32	37 02.30	44 40.004	2925			
END (take off)		07 38	37 02.54	44 39.91	2920			
ON DECK		07 44	----------	----------	----------	----------	----------	----------

DOWNLAD OF DATA

	yyyy/mmm/ddd	Hh:mm
MAPR CLOCK	2001 03 03	07 48 31
SHIP'S CLOCK		07 47 07
RUN TIME	----------	02 40
CUM. RUN TIME	----------	06 35

DATA DOWNLOAD	MAPR SWIFT CR 02.DAT
NO. BLOCKS	13
CUM. NO. BLOCKS	28

Touched bottom w/ 3189 m of wire out.

07:51 - Stop MAPR after downloading data

MAPR SWIFT DR 04

MAPR Serial Number 08 New batteries - No

DEPLOYMENT

	yyyy/mm/dd	Hh:mm	Lon ship	Lat ship	Depth ship	Lon DR/CR	Lat DR/CR	Depth DR/CR
PROGRAMMED	2001 02 03	03 20	----------	----------	----------	----------	----------	----------
IN WATER		04 24	37 58.04	44 27.97	2910			
DR/RC @ BOTTOM		05 28	37 58.07	44 27.99	3016			
END (take off)								
ON DECK		06 37	----------	----------	----------	----------	----------	----------

DOWNLAD OF DATA

	yyyy/mmm/ddd	Hh:mm
MAPR CLOCK		06 46 25
SHIP'S CLOCK		06 46 27
RUN TIME	----------	04 30
CUM. RUN TIME	----------	06 00

DATA DOWNLOAD	DR01.DAT
NO. BLOCKS	16
CUM. NO. BLOCKS	26

BROKEN MAPR - ARM HOLDING NEPHELOMETER
DETACHED FROM MAPR, WATER INCONNECTORS

MAPR SWIFT DR 09

MAPR Serial Number 05 New batteries - No

DEPLOYMENT

	yyyy/mm/dd	Hh:mm	Lon ship	Lat ship	Depth ship	Lon DR/CR	Lat DR/CR	Depth DR/CR
PROGRAMMED	2001 02 28	13 42	----------	----------	----------	----------	----------	----------
IN WATER		14 39	32 30.64	47 07.93	4000			
DR/RC @ BOTTOM		16 02	32 34.26	47 07.94	3700	32-32.6	47 07.94	3860
END (take off)		16 43	32 35.81	47 07 68	3590	32 33.9	47 07.75	3760
ON DECK		17.56	----------	----------	----------	----------	----------	----------

DOWNLAD OF DATA

	yyyy/mmm/ddd	Hh:mm
MAPR CLOCK		18 12 24
SHIP'S CLOCK		18 12 39
RUN TIME	----------	04 30
CUM. RUN TIME	----------	06 00

DATA DOWNLOAD	DR01.DAT
NO. BLOCKS	22
CUM. NO. BLOCKS	26

15:28 Dredge at bottom
15:05 MAPR at lowest point

N°	begins					ends					total	fresh	lithology					glass	sed	comments	dredge site
	lat	lat	long	long	prof	lat	lat	long	long	prof	weight	glass	B	P	G	S	other	in	in		
	°S	min	°E	min	m	°S	min	°E	min	m	kg		%	%	%	%	%	tube	tube		
MP01	30	52,40	43	1,40	2600	30	51.6	43	03.0	2150	800	0	2			98	0			no tube	western edge, Madagascar plateau
MP02	33	2,70	42	47,80	4200	33	2,00	42	48,80	4000										no tube, empty	western edge, Madagascar plateau
DR01	47	8,00	32	33,00	3850	47	7,70	32	25,00	3625	400	1	100					0	1		1, segment end, W
DR02	47	10,00	32	50,60	2300	47	9,60	32	50,00	2250										lost	1, segment center
DR03	47	8,70	32	50,20	2320	47	9,10	32	49,50	2120	100	1,5	99			1		0	0		1 segment center
DR04	44	44,00	35	46,90	2750	44	44,50	35	47,50	2520	300	2,5	100					1	1	biology	3, segment end W
DR05	44	51,70	36	10,50	1320	44	51,30	36	9,80	1220	200	2	100					1	0	shells, coral ?	3, segment center
DR06	44	53,90	36	28,10	2400	44	53,50	36	27,50	2270	500	1,5	100					1	1		3, segment end, E
DR07	44	49,10	36	45,10	3270	44	48,40	36	44,60	3050	40	1	100					1	1		discontinuity 3/4
DR08	44	36,65	37	15,95	2850	44	36,10	37	16,30	2670	200	2	100					1	0		4, segment end, E
DR09	44	37,90	37	30,00	2730	44	37,70	37	29,65	2600	150	1,5	100					1	0		4, segment center
DR10	43	21,37	39	41,12	3120	43	21,30	39	40,95	3060	80	3	100					1	1		6, western flank
DR11	43	23,00	39	49,70	2880	43	22,90	39	49,25	2780	2	2					100	1	1	biology, forams	6, western flank
DR12	43	22,30	39	56,30	2860	43	21,95	39	55,80	2760	50	1,5	100					0	0		6, segment center
DR13	43	24,50	39	58,65	2880	43	24,10	39	58,35	2720	100	3	100					1	1		6, eastern flank
DR14	43	24,05	40	6,00	2770	43	23,80	40	5,65	2640	400	2,5	100					1	0		6, eastern flank
DR15	43	26,00	40	12,55	3000	43	25,65	40	12,35	2800	200	2	100					1	0		6, segment end, E
DR16	43	23,10	39	33,90	3100	43	23,30	39	33,50	2850	200	1,5	100					1	1		6, segment end, W
DR17	43	53,40	40	41,80	2550	43	53,25	40	41,55	2400	5	1	100					1	1		7, western flank
DR18	43	51,75	40	34,65	3000	43	51,15	40	34,50	2930	40	1,5	100					1	1		7, segment end, W
DR19	43	53,50	40	48,40	1970	43	53,15	40	48,15	1919	5	1,5	100					0	0		7, segment center
DR20	43	55,20	40	56,30	2700	43	54,90	40	56,15	2600	4	3	100					1	1		7, eastern flank
DR21	43	23,10	41	29,30	3050	43	22,80	41	28,60	2650	1	0	100					0	1	off axis, quartzite	off axis, Discovery FZ
DR22	42	37,40	41	40,50	3050	42	37,70	41	39,30	2700	300	0			70	30				off axis	off axis, Discovery FZ
DR23	42	48,00	42	7,70	2900	42	48,40	42	7,40	2800	50	1,5	100					0	0		8, segment center
DR24	40	7,50	43	3,30	2780	40	59,95	43	2,90	2200	80	0	25	25		20	30*			off axis, * breccias	off axis, Discovery FZ
DR25	40	59,70	43	22,70	3350	40	59,95	43	23,45	3280	100	3	100					1	1		9, segment center
DR26	40	58,62	44	2,02	3170	40	58.62	44	2.5	3070	200	3	20	80				1	1		discontinuity, 9/10
DR27	41	2,25	44	28,75	3070	41	1,18	44	28,95	2910	150	3		95		5		1	1		discontinuity, 9/10
DR28	38	46,20	47	5,50	3000	38	45,65	47	4,95	2800	30	2	100					1	1		13, center
DR29	38	45,20	47	22,30	3040	38	45,20	47	22,10	2880	30	2	100					1	1	foraminifers	14, center
DR30	38	4,95	48	37,35	2760	38	4,60	48	37,45	2590	100	3	100					1	1		16, center
DR31	38	3,65	48	49,58	2770	38	3,65	48	49,00	2690										empty	16, eastern flank
DR32	38	1,80	48	49,70	2760	38	1,62	48	49,40	2680	50	3	100					1	1		16, eastern flank
DR33	37	51,36	49	11,60	3000	37	51,15	49	11,20	2880	75	3						1	1		17 western end
DR34	37	52,83	49	17,66	2750	37	52,62	49	17,52	2670	150	3						1	0		17 center

Fresh glass : 3 = very shiny and fresh glass ; 2 = fresh glass ; 1 = altered glass ; 0 = no glass
Lithology : B = basalt ; P = peridotite ; G = gabbros and dolerites ; S = sediment ; O = others
Sediment in tube : 1 = present ; 0 = absent Glass in tube : 1 = present ; 0 = absent

SWIFT - Rock Cores

N°	type	lat °		long °		depth map	depth 12kHz	weight g	sediment	glass quality	comments	rock core site
RC01	1	46	3,45	34	14,11	1980	1960	100	0	3	2 pebbles	segment 2, west
RC02	2	44	40,04	37	2,3	3050	2925	1	1	3		disc 3/4, between DR07 and DR08
RC03	2	44	36,5	37	44,75	2840	2890	3	1	2		west of discontinuity 3/4
RC04	2	44	28,37	37	58,07	3030	2920	0,05	0	2		center of discontinuity 4/5
RC05	2	44	19,12	38	12,81	3020	3000	1	1	2		east of discontinuity 4/5
RC06	2	44	9,74	38	23,18	2450	2360	0,25	1	2		west of segment 5
RC07	2	44	9,28	38	26,5	2280	2250	1,5	0	2		west of segment 5
RC08	2	44	9,07	38	34,56	2150	2150	10	1	3		center of segment 5
RC09	2	44	9,7	38	40,17	1690	1700	40	1	3		center of segment 5
RC10	2	44	13,31	38	52	2070	2048	40	1	2,5		east of segment 5
RC11	2	44	15,54	39	3,84	2640	2640	2	0	2,5		east end of segment 5
RC12	2	43	25,65	40	16,99	3260	3250	0,05	1	2,5		close to DR15, segment 6 east
RC13	2	43	55,15	41	5,81	3100	3060	<1	1	2,5		close to DR20, segment 7 east
RC14	1	40	52,49	42	52,43	3370	3310	0	0		empty	discontinuity 8/9
RC15	2	40	59,19	43	8,88	3080	3060	>3	0	3	some pieces >1cm	segment 9, western flank

type : heavy = 1
light = 2

glass 3 = very fresh, shiny glass
2 = fresh glass
1 = altered glass
0 = no glass

sediment 1 = present
0 = absent

weight = approximation, measured on board

ANNEXES

OPERATIONS

Dredging

For dredges MP1, MP2 and DR1- DRX we used a circular dredge from the IFRTP, recently built in South Africa. The dredge stuck regularly on the ocean bottom, this was probably because of its relatively large size (1 m diameter). After DRXX we used lighter rounded dredge of the type « Lister » belonging to GENAVIR. For all dredges a 500 kg weight was also placed on the cable.

The dredge was fixed on a steel cable of 6500m long and 20 mm of diameter (fig. X). A steel tube (length : 60 cm ; diameter : 20 cm) was anchored behind the dredge by two cables (3.20 m in length). This tube dragged along the ocean bottom and collected glass fragments and sediment, sometimes even if the dredge itself was empty. The dredge was attached to the main cable by a weaker cable (diameter : 14.2 mm) which can break under high tension (~18 tonnes). The weight was placed 70 m in front of the dredge, fixed on the main cable. After the lost of one dredge (DR02) and 2500 m of cable (in addition to dredge, weight, MAPR and pinger), a weak cable was also inserted between the weight and the main cable. The loss of DR02 was also probably exascerbated by the rectangular shape of the weight used - which was much more likely to be stuck during dragging along the sea floor than the subsequently used round weight. In future we recommend that both a weak link between the weight and main cable be installed, and that a round-shaped weight is used.

An accoustic pinger was fixed 250 m before the weight to give the water depth. This pinger is necessary when the MAPR (Minature Autonomous Plume Recorder - consisting of a nephelometer within a pressure case containing the electronic system, see description pXX) was fixed to the cable to measure the turbidity of the water and detect hydrothermal plumes. SWIFT carried two MAPR units. The first was used on DR01, and lost with the dredge and a pinger during DR02. The second MAPR was successfully tested during RC01 and RC02. However, during DR04 the vibrations of the cable dismounted the nephelometer from the pressure case. Water came into the connectors and the MAPR was completely disabled as a result.

During dredging operations, the dredge was lowered at a maximum speed of 1.1 m/s. Simple trigonometry allow calculation of the position of the dredge behind the ship, by knowing the length of the cable released and the water depth below the ship. Water depth is given either by the multi-beam data or by a vertical sonar which operated continuously and backed up the multi-beam data. The calculated depth of the dredge can be only considered as an approximation as the slope is not taken into account, nor the curvature of the cable.

The control of the position of the dredge may be improved through the use of a pinger, however, after the loss of the MAPR units, the last dredges (DR3-DR34) were performed without a pinger. To ensure that the dredge reached the sea floor we routinely let an excess of 100-200m of cable out beyond that calculated to be required to reach the bottom. This value also depended upon the angle of the slope being dredged. The maximum slopes dredged were on the off-axis zone fracture walls, otherwise the dredges of axial volcano flanks were all conducted on similar slopes. The arrival of the dredge at the bottom was also indicated by a reduction in the tension of the cable of ~0.5 tonne and a subtle change in frequency of cable tension variations (see " SWIFT : le dragage … c'est du violon"), although given the fluctuations in tension due to movement of the ship in the water, this difference was sometimes difficult to appreciate without experience. For example, DR31 did not touch the bottom, the variation in the cable was confused with irregular wave-induced tension ocillations. Touching on the bottom also resulted in distinct "bites" (transient tension spikes) associated with the dredge catching on the bottom while dragging. By experience, bites of ~7 tonnes were sufficient to feed the dredge with interesting basaltic sample of sufficient size. Dredges of peridotite material in both off axis (DR22, DR24) and axial (DR26, DR27) zones resulted in smoother tensiograms with the dredge interpreted to be gliding along the slopes of serpentinite ridges.

Mean duration of dredges on the sea floor during the cruise was 1 1/2 hours (with three significant "bites" on average), with actual times varying from 20 min up to 3 hours when the dredge was stuck. Time of dredging in the latter stages of the cruise was reduced by decreasing the distance between the point at which the dredge entered the sea and the point at which it reached the sea floor from 2 nm down to 0.3 nm from the target. This resulted in significant time saving. Dredging was against the prevailing wind and/or current direction at a maximum speed of 1 nm (speed on the ground).

After DR09 the main winch bearing broke. This was a recurring problem probably related to the design and manufacture of the winch which suffers from irregular partition of the forces associated with lower the dredge to

the sea floor. The repair of the winch was made by the *chef mecanicien* and the crew in 24 hours, allowing us to perform 25 further dredges. Further breakage resulted in attrocious noises in the bearing after DR11 and these increased with progressive winch use. However, the winch proved able to be used up until the end of the cruise (allowing us to achieve almost all sampling goals), thanks to the careful work of the *chef mecanicien*, maintenance crew and winch operators.

Rock and Glass Coring

Rock coring was performed using two different coring systems. The heaviest of these belonging to IFRTP (the so called "*Carrottier Balut*") is composed of a tube ending in a removable steel casing with a slight conical closure. Inside the conical end are barb-shaped "petals" designed to trap rock material broken by the impact of the coring unit. The core tube was attached to a 700 kg weight and thus the main winch and cable was used to deploy this equipment on the port aft gantry. This rock core unit was used two times: RC01 which collected a suitable sample and RC02 which was empty. The other rock coring was performed with the second coring unit. This was a modified version of the *Langmuir* type, belonging to GENAVIR, without the ring. The head of the corer is slightly convex with five attachment points for steel tubes filled with wax (see figure X). This allowed us to sample fragments of glasses broken by impact of the corer and stuck in the wax. Compared to previous cruises the consistency of the wax was perfect with sufficient resistance to impact. The wax contained from 0.5 - 10 g of glass upon retrieval of the corer. The corer was ballasted by a weight of 500 kg. This allowed coring to be performed by the port amidships winch and gantry (called "*ilôt*") using a conductive cable of 8mm diameter. This provided the flexibility to alternate with dredging, and was especially useful during periods of breakdown of the dredging winch.

For both corers the descent speed was the same: 1 m/s up to 50 m from the sea floor whereupon the speed was reduced to 0.6-0.8 m/s until impact. Impact of the coring units was easily observed on the tensiometer as a large reduction in cable tension. Once impact was observed the corer was hoisted immediately to reduce the potential for loss of wax via abrasion with the sea floor. One wax-corer (RC07) was stuck within the sea floor and required a tension of 14 t to be freed.

SWIFT : le dragage … c'est du violon

Introduction

Le système de treuil utilisé pour draguer à partir du Marion-Dufresne est équipé d'un tensiomètre qui donne à tout instant la tension (le poids) exercée sur le câble. Cet indicateur est souvent la seule source d'information qui permet au « dragueur » de comprendre ce qu'il se passe pendant le dragage. Et un dragueur très averti peut déceler dans les frémissements du tensiomètre le moment où la drague et le lest se posent sur le fond, quand la drague « racle » et croche sur le fond … et finalement quand elle décolle du fond. Cependant ce n'est pas sans difficulté, ni ambiguïté: le tensiomètre présente parfois des ondulations dont l'amplitude est largement plus importante à celle des effets produits par le travail de la drague sur le fond; c'est notamment le cas quand la mer est agitée; l'essentiel des variations de tension est lié aux mouvements du navire, la situation empirant d'autant plus que la longueur de câble filée est importante. Afin d'augmenter l'utilité du tensiomètre, nous avons chercher à modéliser le signal tensiométrique avec pour but de trouver une méthode qui permettrait de mieux extraire les effets propres au dragage et de les rendre plus lisibles. A priori, pour remplir cet objectif, l'option la plus prometteuse nous a semblé être le filtrage du signal du tensiomètre dans le but de retirer les effets propres aux mouvements du bateau. Si l'opération est bien réalisée on peut attribuer les traits du signal filtré aux effets propres du dragage.

Analogie avec une corde vibrante

L'enregistrement de la tension pendant le dragage montre que le câble vibre et l'on peut, avec de l'imagination, comparer le système bateau-câble-lest-drague à la corde d'un violon. Les musiciens, entre autres, savent bien que la fréquence de vibration d'une corde vibrante est essentiellement une fonction de la tension et de la longueur de la corde (qui détermine précisément la fréquence propre de vibration et c'est pourquoi les musiciens passent tant de temps à accorder leurs violons). Le son est produit au moyen de l'archet qui d'une part excite la corde (glissement sur la corde) et d'autre part permet de maîtriser sa tension (pression sur la corde); la longueur de la corde est contrôlée par la position des doigts du musicien sur le manche du violon.

Grâce à cette analogie, on peut déduire que les vibrations du câble de dragage dépendent de causes analogues :

Le poids du câble (fonction de la longueur du câble)

La tension appliquée sur le câble : fonction de l'activité de la drague sur le fond (en vol, au repos sur le fond, ou bien en croche, avec toutes les nuances entre ces états)

Les mouvements du bateau liés à l'état de la mer.

Le tensiogramme

Afin de mettre en évidence les modes vibratoires du câble, nous avons digitalisé le signal du tensiomètre. Cette opération a été réalisée sur trois dragues (DR28, DR32 & DR33 ; voir les figures respectives) avec un système de digitalisation qui permet l'acquisition de 6 mesures par secondes (6 Hz) ce qui en principe limite vers le haut la bande de fréquence à 3 Hz. En plus de ce filtre d'échantillonnage, il est probable que le tensiomètre lui-même est un second filtre mais nous n'en connaissons pas la bande passante, probablement quelques Herz (une étude plus complète du système reste à faire). Si l'on tient compte de ces deux filtres, il est probable que la limite supérieure de la bande passante avec ces moyens se situe vers 2 Hz.

Nous avons ensuite déterminé le spectre de fréquence en calculant la transformée de Fourier des tensiogrammes obtenus sur des fenêtres temporelle de 166 secondes (soit 1000 mesures) principalement parce que nous disposions de faible moyen de calcul (cela équivaut à 57 intervalles temporels pour un tensiogramme de 9500 secondes (DR28)). Enfin pour assurer la « continuité » du spectre au passage d'une fenêtre à sa suivante nous avons lissé le spectre au moyen de la fonction « contour » de Matlab. Une étude beaucoup plus complète reste à faire, notamment utiliser une fenêtre glissante en lieu et place de fenêtres contiguës.

Pour chacune des trois dragues les spectres dans la bande 0 – 1.2 Hz sont présentés sous les tensiogrammes (figures DR28, DR32 & DR33). Les aspects, communs à ces trois dragues, qui ressortent sont les suivants :

Des vibrations très amples dans la bande 0.2 – 0.05 Hz sur toute la durée du tensiogramme ; ils sont principalement dus aux mouvements du bateau. Cependant on constate que cette bande s'élargit vers les hautes fréquences (jusqu'à 0.4 Hz) quand la longueur du câble augmente, et inversement quand la longueur du câble diminue, la limite supérieure revient graduellement de 0.4 Hz à 0.2 Hz.

Des vibrations très amples dans la bande de fréquence inférieure à 0.05 Hz quand la drague et le lest sont sur le fond.

Des vibrations très amples dans la bande de fréquence supérieure à 0.4 Hz quand la drague croche sur le fond.

Au delà de ces constats empiriques, les relations causes-effets restent à analyser plus profondément.

Conclusion

L'étude préliminaire des fréquences contenues dans le tensiogramme montre que les modes vibratoires du système bateau-câble-lest-cable résultent bien des trois causes envisagées ci-dessus (mouvement du bateau, longueur du câble, travail de la drague). Pendant les opérations de dragage, il serait donc souhaitable de disposer en direct des spectres de fréquence du tensiogramme… On pourrait éviter les fausses notes … Et le violon quand c'est mal joué, c'est insupportable ...

(Les violonistes : Martin et Pierre)

Appendix 1 : programme Matlab pour la lecture de l'enregistreur « 2 voies Sefram »

Se reporter à la documentation de l'enregistreur pour les paramètres de la liaison RS232 (pages 6.19 et suivantes notamment)

```
cd c:\martin
s2 = serial('COM2','BaudRate',2400,'DataBits',8);
fopen(s2);
set(s2,'Terminator','CR')
fprintf(s2,'*REM;*RST');
fprintf(s2,'CHAN 2;CAL 5,2.5;PEN 2,ON');
fprintf(s2,'PAP:MOD FT;:PAP:SPE 5,MM_M;:MEA ON');
fprintf(s2,'REC:CHA OFF,ON;UNIT ISO');
fprintf(s2,'PEN 1,OFF');

a=1;
while(i<1)
fprintf(s2,'REC:MEA ?');
mesure = fscanf(s2,'%c')
c=clock;
{*** génère matrice "a" à quatre colonnes ****}
val(a,1) = c(1,4); {heure}
val(a,2) = c(1,5); {minutes}
val(a,3) = c(1,6); {secondes}
p=findstr(mesure(1,:),':');
n = length(mesure);
mesure
val(a,4) = sscanf(mesure(1,p(1,3)+1:n-1),'%f'); {tension en Mv}
val(a,:)
a=a+1;
end

fids = fopen('c:\martin\dr33.txt', 'w'); {sauvegarde les données dans  le fichier "dr33.txt"}
fprintf(fids, '%2d %2d %2.4f %2.6f\n',val');
fclose(fids)
```

Appendix 2 : Analyse du signal

Au prélable, au moyen d'excel par ex, il faut controler le fichier des mesures (dr33.txt) et le transformer en fichier 3 colonnes (dr33_2.txt):

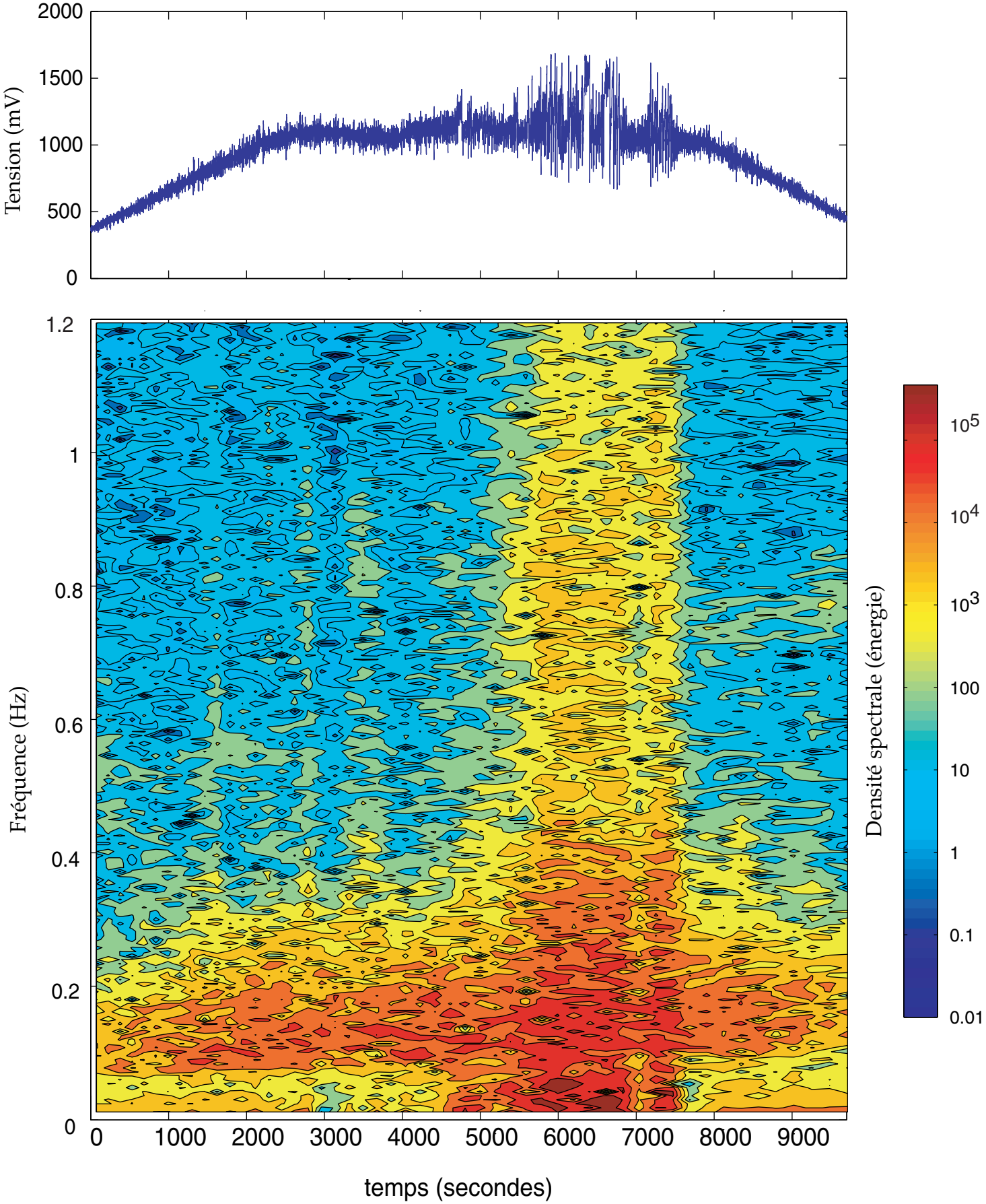
1ere colonne : heure

2eme colonne : temps écoulé depuis la première mesure

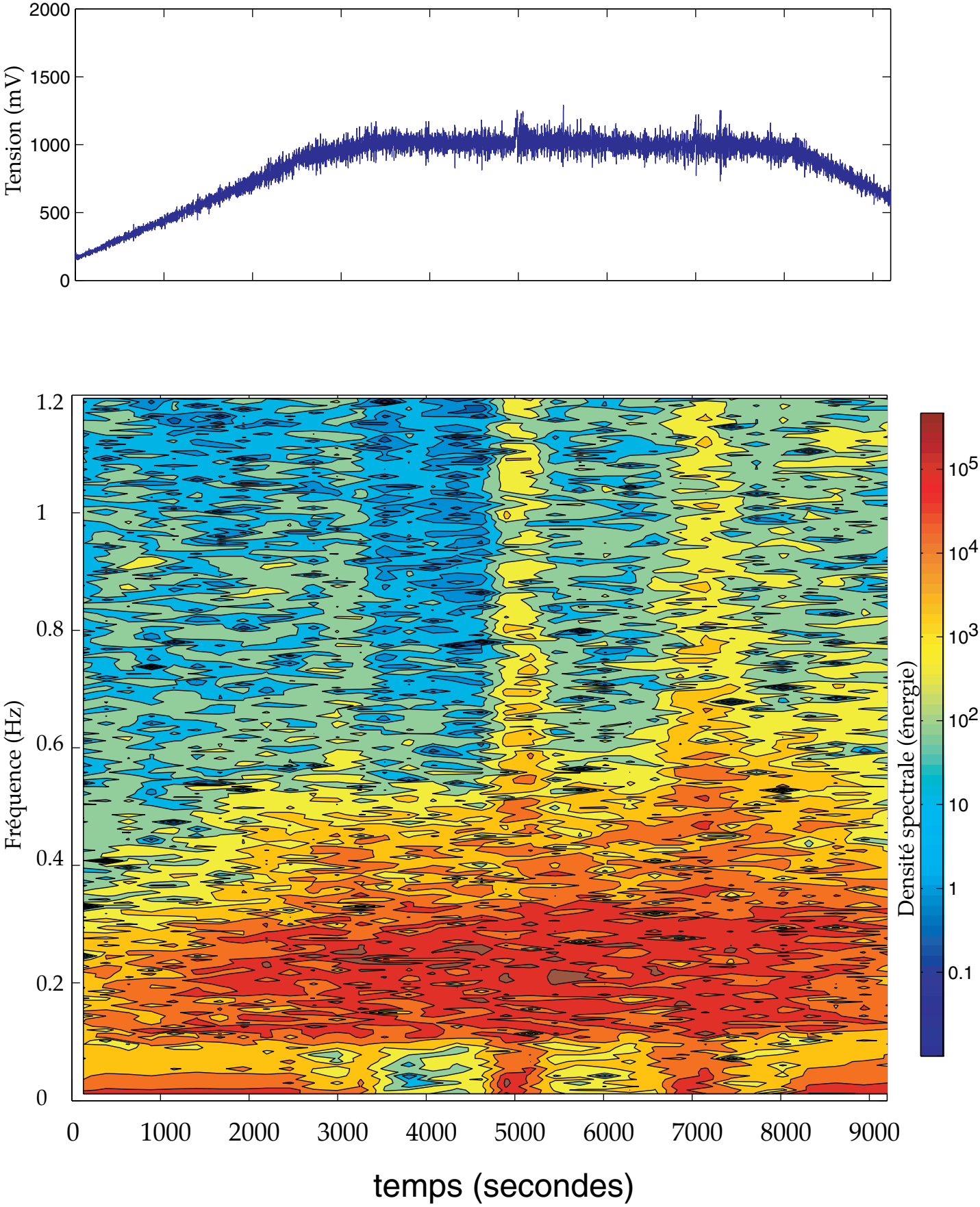
3eme colonne : tension en Mv

```
load dr33.txt

plot(dr33_2(:,2),dr33_2(:,3))            {dessine le tensiogramme}

a=1
n=1
while(a<35)
v = fft(dr32(n:n+1000,2),1000);
Pvv(:,a) = v .* conj(v)/1000;
n=n+1000;
a=a+1;
end        {calcul la FFT sur 34 fenêtres contigü de 1000 mesures de large}



f = 6*(0:1000)/1000; {matrice des index des fréquences}

a=1
n=1
while(a<30)
t(a) = dr33_2(500+((n-1)*1000),2);
n=n+1000
a=a+1
end        {t : matrice pour l'indexation en temps des spectres}


subplot(2,1,1), plot(dr33_2(:,2),dr33_2(:,3))  {dessine le tensiogramme}

subplot(2,1,2),  [C,h] = contourf(t,(f(5:200)),log10(Pvv(5:200,:)),10);
                                                        {dessine les spectres de puissance}
```

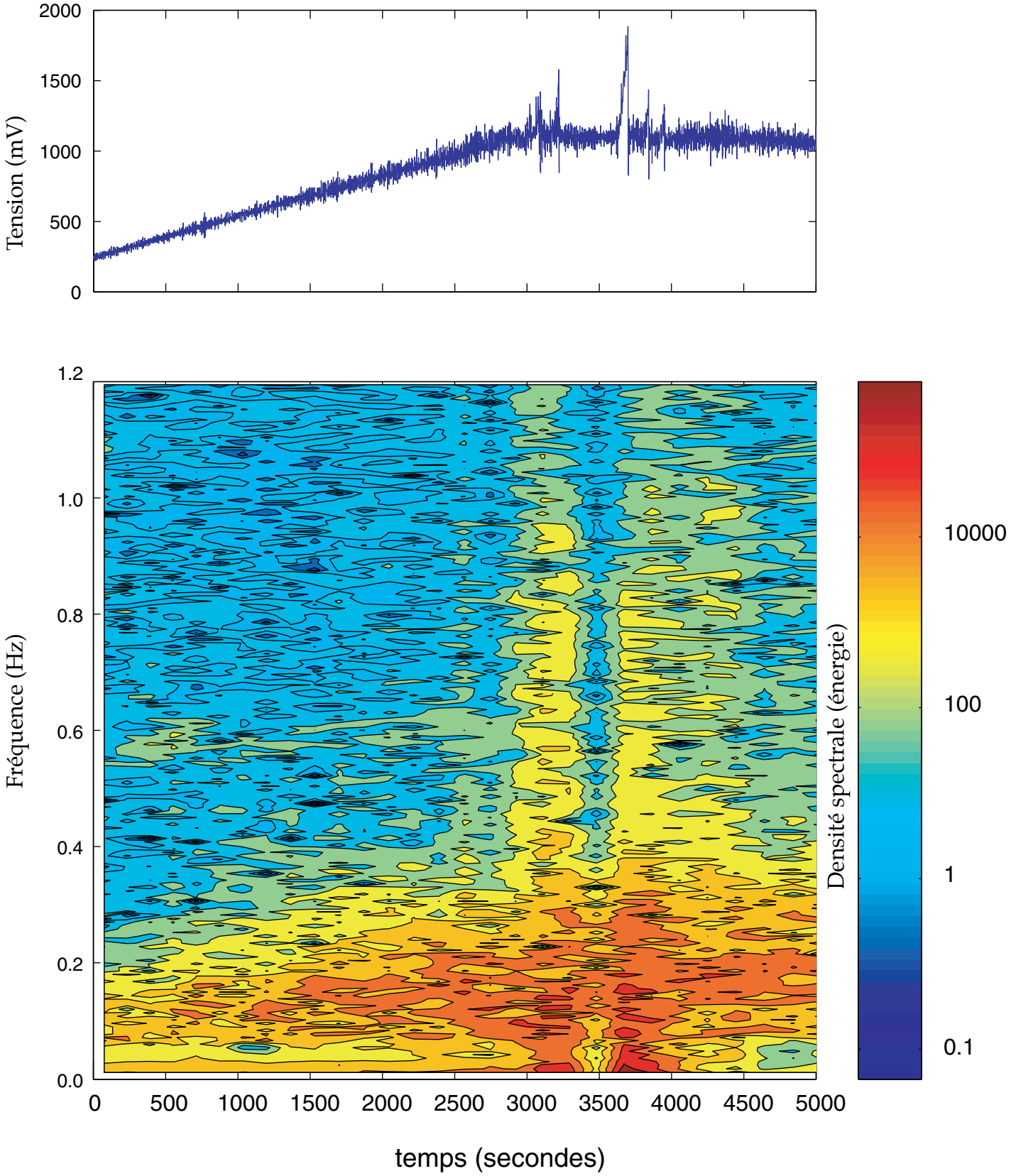
Drague Dr28 du 16 mars 2001



Drague Dr32 du 17 mars 2001



Drague Dr33 du 17 mars 2001



SWIFT samples taken by A. Kent (DLC) for melt inclusion analyses.

Dredge	Sample	Description
DR1	DR1-1-6	Plagioclase-rich phyric basalt with possible minor olivine
	DR1-1-4	Plagioclase-rich phyric basalt with possible minor olivine
	DR1-1-2	Plagioclase-rich phyric basalt with possible minor olivine
DR3	DR3-1-2	Plagioclase-rich phyric basalt with possible minor olivine
	DR3-1-4	Plagioclase-rich phyric basalt with possible minor olivine
DR4	DR4-1-2	Plagioclase-rich phyric basalt with possible minor olivine
	DR4-3-1	Aphyric basalt, possible rare plagioclase and olivine phenocrysts
DR6	DR6-1*	Aphyric basalt, possible rare plagioclase and olivine phenocrysts
	DR6-2-1	Plagioclase-rich phyric basalt with possible minor olivine
	DR6-2*	Plagioclase-rich phyric basalt with possible minor olivine
DR7	DR7-1-6	Moderately plagioclase phyric basalt
DR8	DR8-1-4	Plagioclase phyric basalt, possibly old
DR10	DR10-1-2	Plagioclase phyric basalt with minor olivine
	DR10-2-1	Plagioclase phyric basalt with minor olivine
DR12	DR12-2*	Plagioclase phyric basalt with possible minor olivine
DR13	DR13-1*	Sparsely plagioclase phyric basalt
DR14	DR14-3*	Plagioclase phyric basalt with minor large olivine
DR15	DR15-1-1	Plagioclase phyric basalt with possible minor olivine
	DR15-1-2	Plagioclase phyric basalt with possible minor olivine
DR16	DR16-1*	Plagioclase phyric basalt
DR17	DR17-1-3	Plagioclase-olivine-clinopyroxene phyric basalt
DR19	DR19-1*	Plagioclase phyric basalt
DR 28	DR 28-1-1	Plagioclase phyric basalt with minor olivine
	DR 28-1-2	Plagioclase phyric basalt with minor olivine

DR 33	DR 33-1-5	Sparsely plagioclase phyric basalt. Possible resorbtion in phenocrysts
DR 34	DR 34-1-3	Plagioclase phyric basalt, phenocrysts concentrated on chilled exterior
Total	**26 samples**	**Mostly plagioclase (± minor olivine) phyric lavas**

* Representative sample of it's type but not from a numbered SWIFT sample

NB. Where possible all samples are from adjacent to rapidly cooled margin and most contain small amount of glass

Liste des échantillons prélevés durant la campagne SWIFT pour le Laboratoire de DLC Axiom des Isotopes Ragiogenic (København). **(BOLD = U/Th)**

DR 01:
- DR01-1-1

DR 03:
- DR03-1-1
- DR03-1-2
- DR03-1-3
- DR03-1-4

DR 04:
- DR04-1-1
- DR04-1-2
- DR04-1-3
- DR04-1-4
- DR04-2-3
- DR04-2-4
- DR04-2-6
- DR04-2-8
- DR04-2-12
- DR04-2-13
- DR04-2-14

DR 05:
- DR05-1-1
- DR05-1-2
- DR05-1-3

DR 06:
- DR06-1-1
- DR06-1-2
- DR06-1-3
- DR06-1-4
- DR06-2-1
- **DR06-2-2**
- DR06-3-1
- DR06-3-3
- DR06-3-4
- DR06-3-6
- DR06-3-7
- DR06-3-8
- DR06-3-9

DR 07:
- DR07-1-1

DR 08:
- DR08-1-1
- **DR08-2-1**
- **DR08-2-2**
- **DR08-2-3**
- DR08-2-6
- DR08-2-8
- DR08-2-9

DR 09:
- DR09-1-2
- DR09-1-3
- DR09-1-5
- DR09-1-6
- DR09-1-8

DR 10:
- DR10-1-2
- DR10-2-1
- DR10-2-2a
- DR10-2-2b
- DR10#2
- DR10#3
- DR10#4

DR 12:
- DR12-1-1
- DR12-2-1
- DR12-2-2
- DR12-2-3
- DR12-2-8

DR 13:
- **DR13-1-1**
- **DR13-1-2**
- **DR13-1-7**
- **DR13-1-8**
- **DR13-1-9**
- **DR13-1-10**
- **DR13-1-15**
- DR13-1-16
- **DR13-1-17**
- **DR13-1-19**

DR 14:
- **DR14-1-1**
- DR14-1-2
- **DR14-1-3**
- **DR14-1-4**
- **DR14-1-6**
- **DR14-2-1**
- **DR14-2-2**
- DR14-3-1
- DR14-3-2

DR 15:
- **DR15-1-1**
- **DR15-1-2**
- DR15-2-4
- DR15-2-5
- DR15-2-6
- DR15-2-7

DR 16:
- DR16-1-4
- DR16-2-1
- DR16-3-2
- DR16-3-3

DR 17:
- DR17-1-2
- **DR17-1-3**
- DR17-1-7

DR 18:
- DR18-1-1

DR 19:
- DR19-1-6
- DR19-1-8

DR 20:
- **DR20-1-1**
- DR20-1-2
- DR20-1-3
- **DR20-1-4**

DR 23:
- **DR23-1-1**
- **DR23-1-4**

DR 25:
- **DR25-1-2**
- **DR25-1-4**
- DR25-1-21

DR 28:
- **DR28-1-1**
- **DR28-2-1**

DR 29:
- **DR29-1-1**
- **DR29-1-2**
- **DR29-2-1**

DR 30:
- **DR30-1-2**
- **DR30-1-3**
- **DR30-1-4**

DR 32:
- **DR32-1-1**
- **DR32-1-3**

DR 33:
- DR33-1-1
- **DR33-1-2**
- DR33-1-3

DR 34:
- DR34-1-2
- **DR34-2-1A**

SWIFT

Benoît Ildefonse Samples

note : sample ID is the SWIFT one

bi-1 & bi-2 : bags / box : fragile samples

Bag/box	Sample #	Sample ID	photo (original)	Comments
bi-1	B1	DR01-1-1	DR01-1-1.JPG	basalt with plag (± ol) phenocrysts. not very fresh
bi-1	B2	DR01-2	DR01-2.JPG	basalt with plag (± ol) phenocrysts. not very fresh
bi-1	B3	DR03-1-1	DR03-1-1.JPG	plagioclase-rich, porphyritic basalt
bi-1	B4	DR03-2	DR03-2.JPG	aphyric basalt, fresh + small pieces of glassy rims
bi-1	B5	DR04-1a	DR04-1a.JPG	fresh basalt, slightly plagioclase phyric
bi-1	B6	DR04-1b	DR04-1b.JPG	pillow section, basalt, slightly plagioclase phyric
	B6	DR04-1b	DR04-1b'.JPG	pillow section, basalt, slightly plagioclase phyric (other side)
bi-1	B8	DR05-1	DR05-1.JPG	vesicular, plag-phyric basalt
bi-1	B9	DR05-1-5	DR05-1-5.JPG	vesicular, plag-phyric basalt. slab
bi-1	B10	DR06-1(3)	DR06-1(3).JPG	fresh basalt, mostly aphyric
bi-1	B11	DR06-2	DR06-2.JPG	porphyritic basalt (plag, ol & cpx)
bi-1	B12	DR07-1-3	DR07-1-3.JPG	basalt, with a few plagioclase microphenocrysts and vesicles
bi-1	B13	DR07-1-5	DR07-1-5.JPG	basalt, with a few plagioclase microphenocrysts and vesicles (slab, with radial cracks from the pillow rims)
bi-1	B14	DR08-1-3	DR08-1-3.JPG	plagioclase-rich, porphyritic basalt
bi-1	B15	DR08-2	DR08-2.JPG	fresh, aphyric basalt
bi-1	B16	DRO9-1	DR09-1.JPG	fresh, vesicular, aphyric basalt. some plag & ol microphenocrysts
bi-1	B17	DR10-2-1	DR10-2-1.JPG	plagioclase phyric basalt, vesicles
bi-1	B18	DR12-1-1	DR12-1-1.JPG	plagioclase phyric basalt
bi-1	B19	DR13-1-4	DR13-1-4.JPG	mostly aphyric basalt
bi-1	B20	DR14-1-4	DR14-1-4.JPG	aphyric, fresh basalt
bi-1	B21	DR15-1	DR15-1.JPG	plag-rich, vesicular, phyric basalt
bi-1	B22	DR16-1a	DR16-1a.JPG	aphyric, fresh basalt
bi-1	B23	DR16-2a	DR16-2a.JPG	vesicular, altered basalt
bi-1	B24	DR16-2b	DR16-2b.JPG	vesicular, altered basalt
bi-1	B25	DR16-1b	DR16-1b.JPG	aphyric, altered basalt
bi-1	B26	DR16-1c	DR16-1c.JPG	plag phyric, altered basalt
bi-2	B27	DR18-1-2	DR18-1-2.JPG	aphyric basalt, with a few plag microphenocrysts
bi-2	B28	DR22-1-1	DR22-1-1.JPG	sediment
bi-2	B29	DR22-2-2	DR22-2-2.JPG	microgabbro (gabbronorite?)
bi-2	B30	DR22-2-5	DR22-2-5.JPG	microgabbro (gabbronorite?)
bi-2	B31	DR22-3-2	DR22-3-2.JPG	coarse-grained, altered, ± LT deformed gabbro
bi-2	B32	DR22-3-4	DR22-3-4.JPG	coarse-grained, altered, ± LT deformed gabbro
box	B33	DR22-3a	DR22-3a.JPG	coarse-grained, altered, ± LT deformed gabbro (2 slabs)
bi-2	B34	DR22-3b	DR22-3b.JPG	coarse-grained, altered, ± LT deformed gabbro (bloc + 3 slabs)
bi-2	B35	DR22-2	DR22-2.JPG	microgabbro (gabbronorite?)
bi-2	B36	DR23-1	DR23-1.JPG	aphyric basalt, from altered pillow
bi-2	B37	DR24-1-3	DR24-1-3.JPG	altered basalt (?)
bi-2	B38	DR24-5-1	DR24-5-1.JPG	sediment (breccia, volcanoclastic?)
bi-2	B39	DR24-4-2	DR24-4-2.JPG	serpentinized peridotite (hzb ?)
box	B39	DR24-4-2	DR24-4-2'.JPG	serpentinized peridotite (hzb ?). slab
bi-2	B40	DR24-4-3	DR24-4-3.JPG	serpentinized peridotite (hzb ?)
box	B40	DR24-4-3	DR24-4-3'.JPG	serpentinized peridotite (hzb ?). slab
bi-2	B41	DR24-4-5	DR24-4-5.JPG	serpentinized peridotite (hzb ?). slab
box	B41	DR24-4-5	DR24-4-5'.JPG	serpentinized peridotite (hzb ?)
bi-2	B42	DR24-1-2	DR24-1-2.JPG	altered vesicular basalt
bi-2	B43	DR25-1-1	DR25-1-1.JPG	fresh basalt
bi-2	B44	DR26-1a	DR26-1a.JPG	hematitic basalt
box	B44	DR26-1a	DR26-1a'.JPG	hematitic basalt
bi-2	B45	DR26-1b	DR26-1b.JPG	hematitic basalt
bi-2	B46	DR26-1c	DR26-1c.JPG	hematitic, variolitic basalt
box	B47	DR26-2a	DR26-2a.JPG	serpentinized peridotite - slab
box	B48	DR26-2b	DR26-2b.JPG	serpentinized peridotite - slab
box	B49	DR26-2c	DR26-2c.JPG	serpentinized peridotite - 2 slabs
bi-2+box	B50	DR26-2-1	DR26-2-1.JPG	serpentinite (slabs in fragile box)
bi-2	B51	DR26-2-9	DR26-2-9.JPG	px-rich, serpentinized peridotite
box	B51	DR26-2-9	DR26-2-9'.JPG	px-rich, serpentinized peridotite
bi-2	B52	DR26-2-10	DR26-2-10.JPG	px-rich, serpentinized peridotite
box	B52	DR26-2-10	DR26-2-10'.JPG	px-rich, serpentinized peridotite
bi-2+box	B53	DR26-2d	DR26-2d.JPG	px-rich, serpentinized peridotite (green+yellow) (slab in fragile box)
bi-2	B54	DR26-2e	DR26-2e.JPG	px-rich, serpentinized peridotite (green)
box	B54	DR26-2e	DR26-2e'.JPG	px-rich, serpentinized peridotite (green)
bi-2	B55	DR26-2f	DR26-2f.JPG	px-rich, serpentinized peridotite (green)
box	B55	DR26-2f	DR26-2f'.JPG	px-rich, serpentinized peridotite (green)
bi-2	B56	DR26-2g	DR26-2g.JPG	px-rich, serpentinized peridotite (yellow)
box	B56	DR26-2g	DR26-2g'.JPG	px-rich, serpentinized peridotite (yellow)
bi-2	B57	DR26-2h	DR26-2h.JPG	px-rich, serpentinized peridotite (yellow)
box	B57	DR26-2h	DR26-2h'.JPG	px-rich, serpentinized peridotite (yellow)
bi-2	B58	DR26-2i	DR26-2i.JPG	px-rich, serpentinized peridotite (yellow)
box	B58	DR26-2i	DR26-2i'.JPG	px-rich, serpentinized peridotite (yellow)
bi-3	B59	DR26-2j	DR26-2j.JPG	serpentinized dunite (?)
bi-3	B60	DR26-2k	DR26-2k.JPG	serpentinized dunite (?)
bi-3	B61	DR26-2l	DR26-2l.JPG	serpentinized peridotite
bi-3	B62	DR27-1	DR27-1.JPG	px-rich, serpentinized peridotite
box	B62	DR27-1	DR27-1'.JPG	px-rich, serpentinized peridotite
bi-3	B63	DR28-1-1	DR28-1-1.JPG	plag phyric basalt (cracks)
bi-3	B64	DR30-1	DR30-1.JPG	aphyric, fresh basalt (a few plag phenocrysts)
bi-3	B65	DR32-1	DR32-1.JPG	aphyric, fresh basalt
box	B65	DR32-1	DR32-1'.JPG	aphyric, fresh basalt
bi-3	B66	DR33-1	DR33-1.JPG	aphyric, fresh basalt (a few plag phenocrysts)
box	B67	DR34-1a	DR34-1a.JPG	plag phyric basalt (4 slabs, pillow crust)
bi-3	B68	DR34-1b	DR34-1b.JPG	plag phyric basalt

Table : List of samples that will be selected for lead, uranium/thorium isotope measurements (DLC Lab.), noble gases (Gaz Rares Lab.) and stable isotope (C, H, O, N) analyses (GIS Lab.). All samples will be analysed for major and trace elements in Paris.

Sample	DLC	Gaz Rares	GIS
DR01 -1-1	#	#	#
DR03 -1-1	#	#	#
DR03 -1-2	#		
DR03 -1-3	#		
DR03 -1-4	#	#	#
DR04 -1-1	#	#	#
DR04 -1-2	#	#	#
DR04 -1-3	#	#	#
DR04 -2-3	#	#	#
DR04 -2-4	#		
DR04 -2-5			#
DR04 -2-6	#		#
DR04 -2-8	#		
DR04 -2-12	#		
DR04 -2-13	#		
DR04 -2-14	#		
DR05 -1-1	#	#	#
DR05 -1-2	#	#	#
DR05 -1-3	#		
DR06 -1-1	#	#	#
DR06 -1-2	#		#
DR06 -1-3	#	#	
DR06 -1-4	#		
DR06 2-1	#		
DR06 2-2	##	#	#
DR06 -3-1	#		#
DR06 -3-3	#	#	
DR06 -3-4	#		#
DR06 3-6	#	#	#
DR06 3-7	#		
DR06 3-8	#	#	
DR06 3-9	#		
DR07 -1-1	#	#	#
DR08 -1-1	#		

Sample	DLC	Gaz Rares	GIS
DR08 -2-1	##	#	#
DR08 -2-2	##		#
DR08 -2-3	##		
DR08 -2-6	#	#	
DR08 -3-2		#	
DR08 -2-4		#	#
DR08 -2-5#in			#
DR08 -2-8	#		
DR08 -2-9	#		
DR09 -1-2	#	#	#
DR09 -1-3	#	#	#
DR09 -1-5	#	#	
DR09 -1-6	#		#
DR09 -1-8	#	#	#
DR10 -1-2	#		
DR10 -2-1	#		
DR10 -2-2a	#	#	
DR10 -2-2b	#		
DR10 #2	#		
DR10 #3	#		
DR10 #3	##		
DR12 -1-1	#		#
DR12 -2-1	#	#	
DR12 -2-2	#	#	#
DR12 -2-3	#	#	
DR12 -2-8	#	#	#
DR13 -1-1	##	#	#
DR13 -1-2	##	#	#
DR13 -1-6			#
DR13 -1-7	##	#	#
DR13 -1-8	##		
DR13 -1-9	##		
DR13 -1-10	##		#
DR13 -1-15	##		

Sample	DLC	Gaz Rares	GIS
DR13 -1-16	#	#	#
DR13 -1-17	##		#
DR13 -1-19	##	#	#
DR14 -1-1	##	#	#
DR14 -1-2	#		
DR14 -1-3	##	#	#
DR14 -1-4	##	#	#
DR14 -1-6	##	#	#
DR14 -2-1	##		
DR14 -2-2	#		#
DR14 -3-1	#		
DR14 -3-2	#		
DR15 -1-1	#	#	#
DR15 -1-2	#	#	#
DR15 -2-4	#		
DR15 -2-5	#	#	#
DR15 -2-6	#		#
DR15 -2-7	#		
DR16 -1-4	#		
DR16 -2-1	#	#	#
DR16 -3-2	#		
DR16 -3-3	#		#
DR17 -1-2	#		#
DR17 -1-3	##	#	#
DR17 -1-7	#		
DR18 -1-1	#		#
DR19 -1-6	#	#	#
DR19 -1-8	#		
DR20 -1-1	##	#	#
DR20 -1-2	#	#	#
DR20 -1-3	#		#
DR20 -1-4	##	#	#
DR23 -1-1	#	#	#
DR23 -1-3		#	#
DR23 -1-4	#		
DR25 -1-2	##		#
DR25 -1-4	##		#
DR25 -1-7			#

Sample	DLC	Gaz Rares	GIS
DR25 -1-13		#	#
DR25 -1-21	#	#	#
DR28 -1-1	##	#	#
DR28 -2-1	##	#	#
DR29 -1-1	##	#	#
DR29 -1-2	##		
DR29 -2-1	##	#	#
DR30 -1-2	##	#	#
DR30 -1-3	##		
DR30 -1-4	##	#	#
DR30 #1	Sample to be divided into three parts		
DR30 #2	Sample to be divided into three parts		
DR32 -1-1	##	#	#
DR32 -1-3	##		
DR32 #1	Sample to be divided into three parts		
DR32 #2	Sample to be divided into three parts		
DR33 -1-1	#	#	#
DR33 -1-2	##	#	#
DR33 -1-3	#		
DR33 #1	Sample to be divided into three parts		
DR33 #2	Sample to be divided into three parts		
DR34 -1-2	#		
DR34 -2-1A	##	#	#
DR34 #1	Sample to be divided into three parts		

DLC : Danish Lithosphere Center

Gaz Rares : Laboratoire de Géochimie et Cosmochimie

GIS : Géochimie des Isotopes Stables

# denotes for selected samples, ## denoting for samples which will be analysed also for uranium/thorium disequilibria by DLC.

Echantillons de CROZET

Ile de la Possession, baie du Marin

Crozet 1

Small pebble form the beach, 5x5x3cm
olv-plagio-cpx phyric lava, 20% phenocrysts
The cpx reach 5mm in size, the other minerals are smaller
abundant (5% ?) rounded vesicles, empty

Crozet 2

Small pebble from the beach, 9x6x4cm
Highly vesicular lava, black. At least 20% vesicles, irregular in shape, empty.
Mostly aphyric.

Crozet 3

Large pebble from the beach, 20x10x8
Olv-plagio-cpx phyric lava, more grayish. 10% phenocrysts ? (less abundant and smaller than in crozet 1)
cpx reach 10mm, the other mineral are smaller (a few mm max)

Crozet 4

broken from an outcrop above the pier. The outcops shows alternating fine grained flows (like this sample) and layers of blocks, a few cm to several decimeters, welded.
15x8x4cm
Samples 1, 2 and 3 may be blocks eroded form these layers.
Fine grained welded tuff, with some crystals, mostly px, possibly some olv.

Crozet 5

Broken from the same outcrop
30x20x5 cm
Obvious layering. Fine-grained welded tuff with some crystals (cpx ?)

Outcrop photographs

1 - General view
2 - Alternating layers of fine grained tuffs (crozet 4 and 5) and blocky layers : pyroclastic lava flows ?
3 - Detail of one pyroclastic flow. The blocks are welded in a fine-grained matrix

Drague #	Nb de sac	N°	contenu	commentaires	caisse
MP01	3	1	MP01-1 type 1		
		2	MP01-2 type 2		
		3	MP01 types 1, 2 and 3		
MP02				empty	
DR01	7	4	DR01-1-1		
		4A	DR01	fragile	
		5	DR01-1-2 et 1-6		
		6	DR01-1-3		
		7	DR1-1-4 et 1-5		
		8	DR01-1-7		
		9	DR01-1-8		
DR02				lost	
DR03	8	10	DR03-1-2		
		10*	DR03-1-1		
		10**	DR03-3		
		11**	DR03-3		
		11	DR03-1-4		
		10***	DR03		
		11***	DR03		
		11*	DR03-2-1 et type 2		
DR04	13	12	DR04-1-3 vrac		
		13	DR04-1-3 vrac		
		14	DR04-1-3 vrac		
		15	DR04-1-3		
		16	DR04-1-2		
		17	DR04-1-1		
		18	DR04-1-4		
		12A	DR04	slabs, verre	
		13A	DR04	slabs, verre	
		14A	DR04	slabs, verre	
		15A	DR04	slabs, verre	
		16A	DR04	fragile	
		17A	DR04	fragile	
DR05	3	19	DR05-1-1/1-2/1-3		
		20	DR05-1-4/type 2		
		19A	DR05	fragile	
DR06	10	21	DR06-1-1/DR06-3-4		
		22	DR06 vrac types 3 et 4		
		23	DR06 vrac types 1 et 2		
		24	DR06 type1, 1-2/1-3/1-4		
		25	DR06-2-1		
		26	DR06 vrac type 1 et 3		
		27	DR06-2-2		
		21A	DR06	sampled for glass	
		22A	DR06	sampled for glass	
		23A	DR06	sampled for glass	
DR07	1	28	DR28		
DR08	6	29	DR08-1-1/1-2/1-3		
		29A	DR08	fragile	
		30A	DR08	fragile	
		30	DR08-1-4		
		31	DR08-2-(1/2/3/4/7/8/9)		
		32	DR08 type 2 vrac		
DR09		33	DR09 type 1		
	5	34	DR09 type 1		
		33*	DR9-1-5/1-6/1-7/1-8/1-9		
		34*	DR9-1-5/1-6/1-7/1-8/1-9		
		33A	DR33	sampled for glass	
DR10	6	35	DR10-2-1		
		36	DR10-2-1		
		36*	DR10-1-9		
		36**	DR10-1-9		
		35A	DR10	fragile	
		36A	DR10	fragile	
DR11				empty, sed in tube	
DR12	5	37	DR12-1-1		
		37A	DR12 + DR06	fragile	
		38	DR12-1-1		
		39	DR12-2-2		
		39*	DR12-2-1/12-2-9		
DR13	10	40	DR13 type 1	small samples with glass	
		41	DR13 type 1	small samples with glass	
		42	DR13 type 1	small samples with glass	
		43	DR13-1-1		
		44	DR13-1	échantillons témoins	
		45	DR13	échantillons témoins	
		44*	DR13-1-17/1-19/1-20/1-2		
		45*	DR13-1-5/1-3/2-1/1-1/1-6/1-2/1-10		
			1-8/1-15/1-16/1-7/1/9/1-4/1-21/1-19		
		40A	DR13	fragile	
		40B	DR13	fragile	

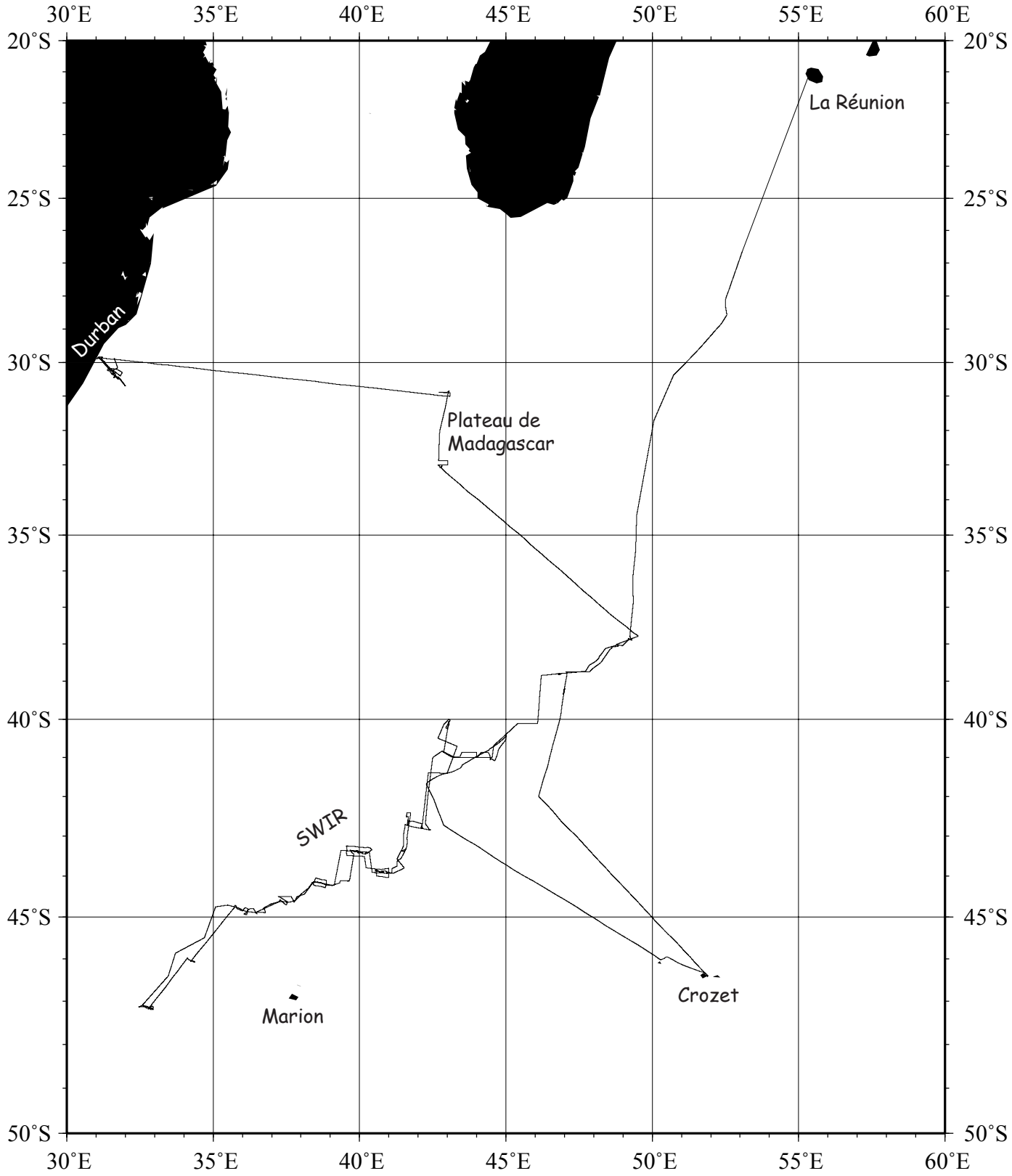
Drague #	Nb de sac	N°	contenu	commentaires	caisse
DR14	7	46	DR14-1-1/1-2		
		47	DR14-1-3/1-4		
		48	DR14-1-5/1-7/2-1		
		49	DR14 type3 3-1/3-2		
		46A	DR14 verre	fragile	
		47A	DR14		
		48A	DR14		
DR15	7	50	DR15 type1		
		51	DR15type 1		
		52	DR15 type 2		
		53	DR15 type 2		
		54	DR15 type 2		
		50A	DR15	fragile	
		51A	DR15	fragile	
DR16	4	55	DR16 type 1		
		56	DR16 type 1 et 2		
		57	DR16 type 3		
		57A	DR16-DR17-DR18-DR21	fragile	
DR17				no bag	
DR18	2	58	DR18		
		58A	DR18		
DR19				no bag	
DR20				no bag	
DR21				no bag	
DR22	7	59	DR22 type 1		
		60	DR22 type 2		
		61	DR22 type 2		
		62	DR22 type 3		
		63	DR22 type 3		
		59A	DR22	fragile	
		64	DR22 vrac + restes		
DR23	3	65	DR23 type 1		
		65A	DR23	fragile	
		66	DR23 type 1		
DR24	3	67	DR24 type 1, 2 and 6		
		68	DR24 type 3 and 4		
		69	DR24 type 4 and 5		
DR25	4	70	DR25 type 1		
		71	DR25 type 1 éch témoins		
		70A	DR25	fragile	
		72	DR25 type 1 remaining glzss samples		
DR26	9	73	DR26 type 1		
		74	DR26 type 1		
		75	DR26 type 2 with #		
		76	DR26 type 2 with # + 26-3-4		
		77	DR26 -2-11		
		78	DR26 type 2 cut samples/no #		
		79	DR26 type 2 cut samples/no #		
		80	DR26 type 2 cut samples/no #		
		81	DR26 type 2 cut samples/no #		
		82	DR26 type 2 vrac		
DR27	4	83	DR27 type 1		
		83A	DR26, DR24, DR27 slabs	fragile	
		82A	DR26, DR24, DR27 slabs	fragile	
		84	DR27 type 2		
	1	**49A**	DR04-05-06-07-10-12-13-14	fragile	
	1	**59A**	DR13-14-22	fragile	
DR28	2	85	DR28		
		86	DR28		
DR29	1	87	DR29		
DR30	3	88	DR30 type 1		
		89A	DR30 samples with glass	fragile	
		90A	DR30 samples with glass	fragile	
DR31				empty	
DR32	3	91	DR32-1-1/1-2/1-3/1-5		
		92	DR32-1-1/1-2/1-3/1-5		
		92A	samples with glass not removed	fragile	
DR33	2	**93A**	DR32, glassy margins	fragile	
		94	DR33-1-1		
DR34	3	95	DR34 type 1 and 2		
		96	DR34 type 1 vrac		
		97	DR34		
	1	**97A**	slabs DR34, DR30, DR28, DR7	fragile	
CROZET	1	crozet	CROZET		

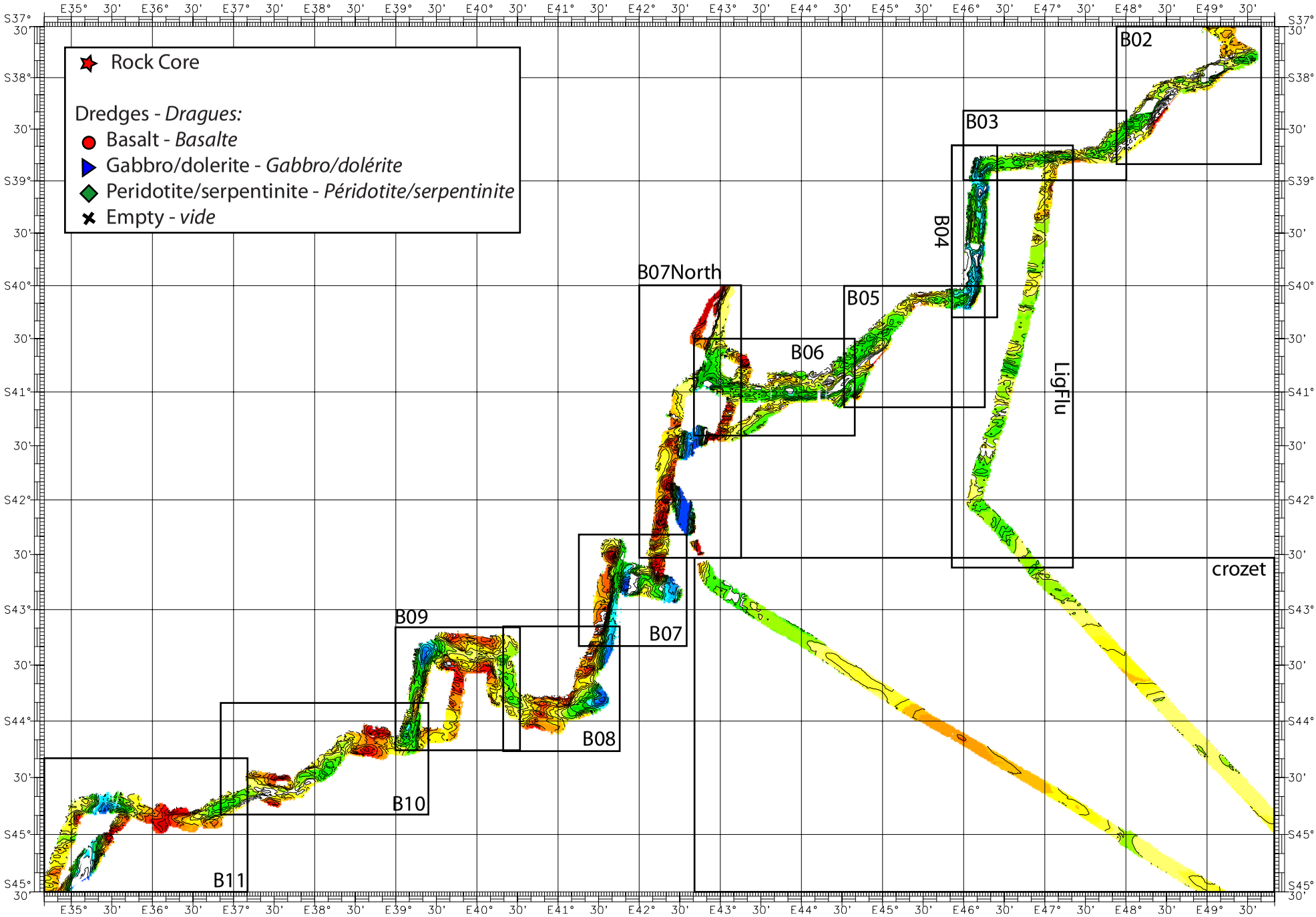
TOTAL 145

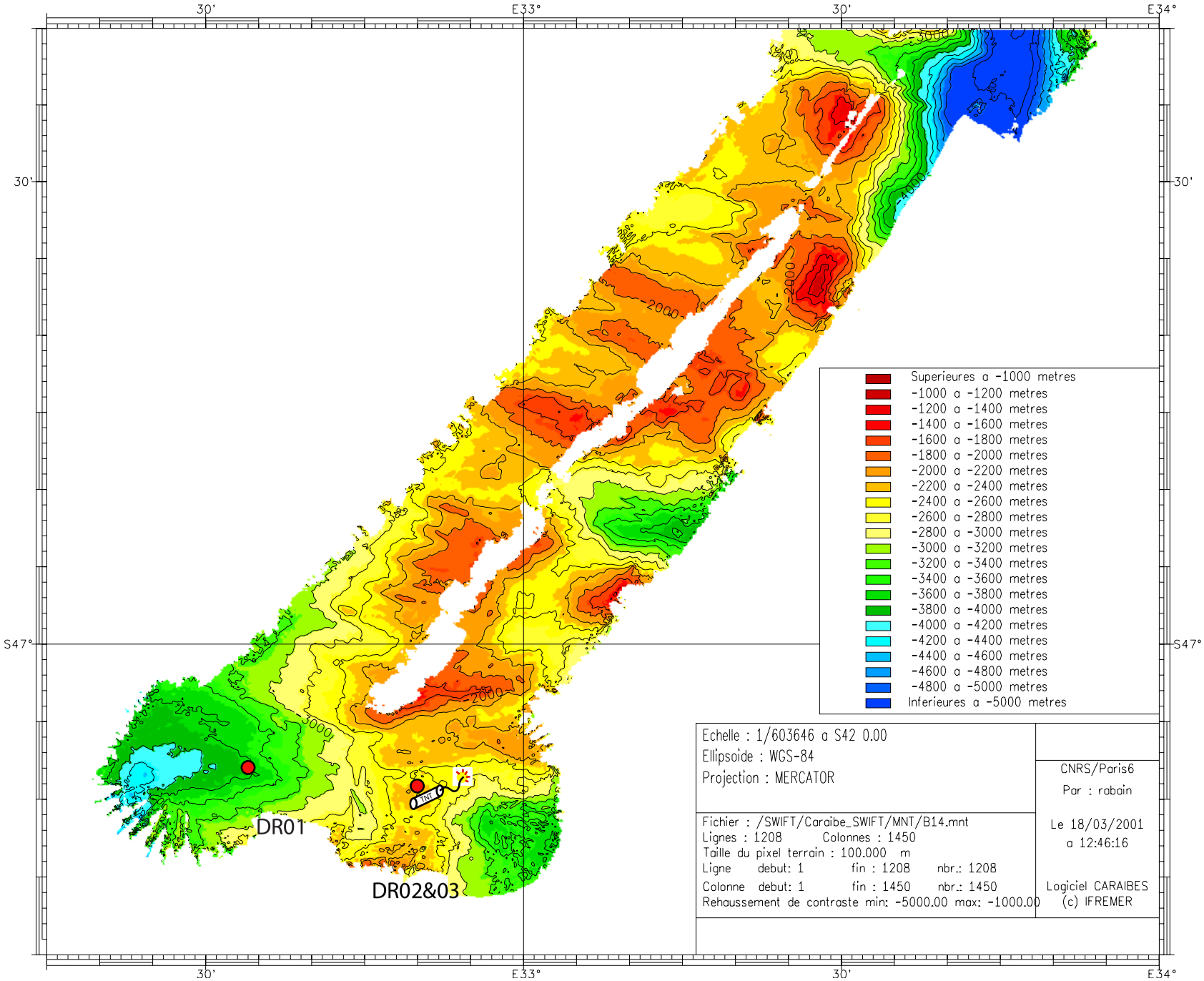
1 valise : glass stations + sediments
1 bidon platsique = sédiments

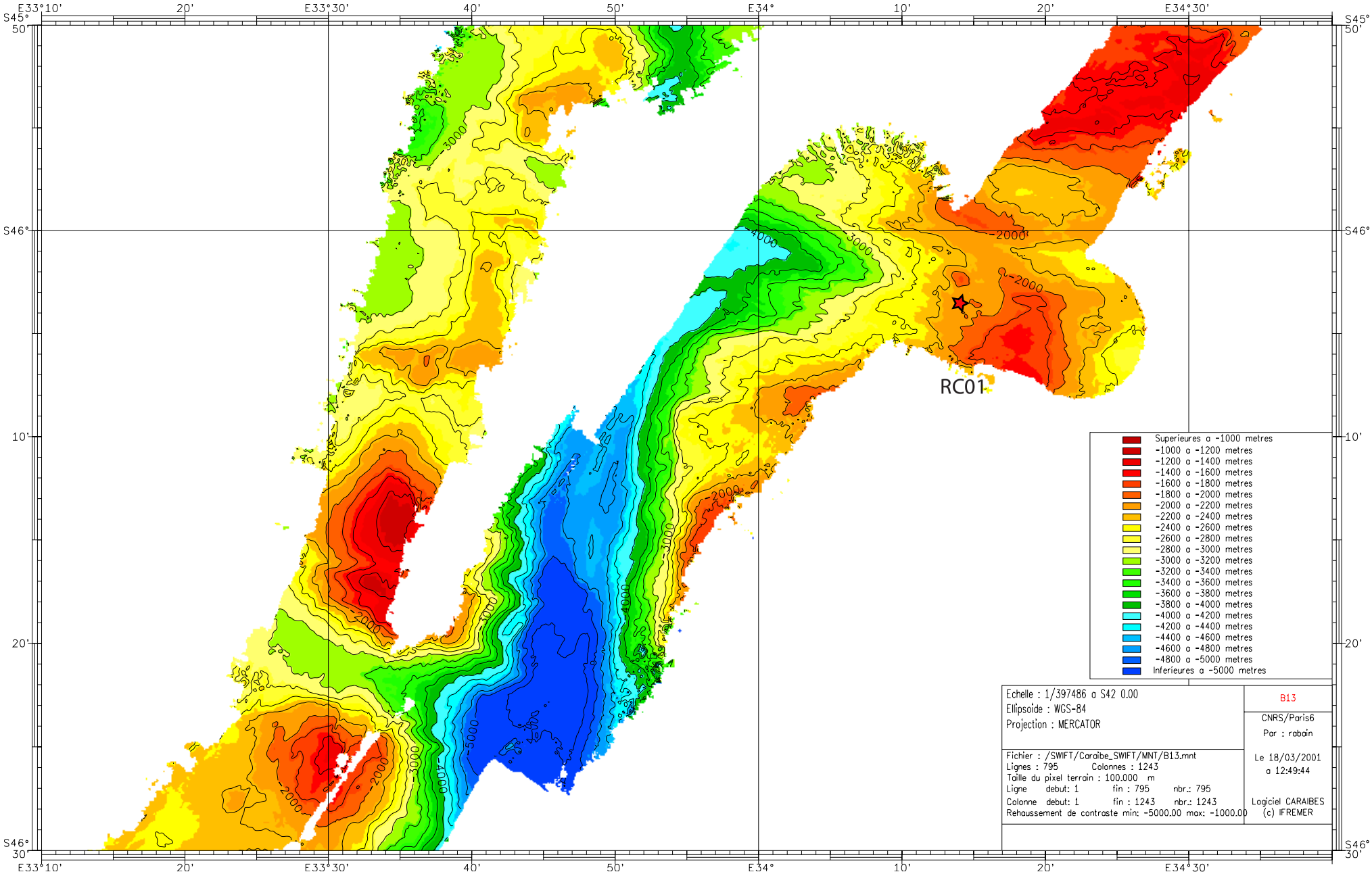
TOUS LES SACS A ÉCHANTILLONS FRAGILES (A) ONT ETE MIS DANS LA CAISSE CLOISONNÉE

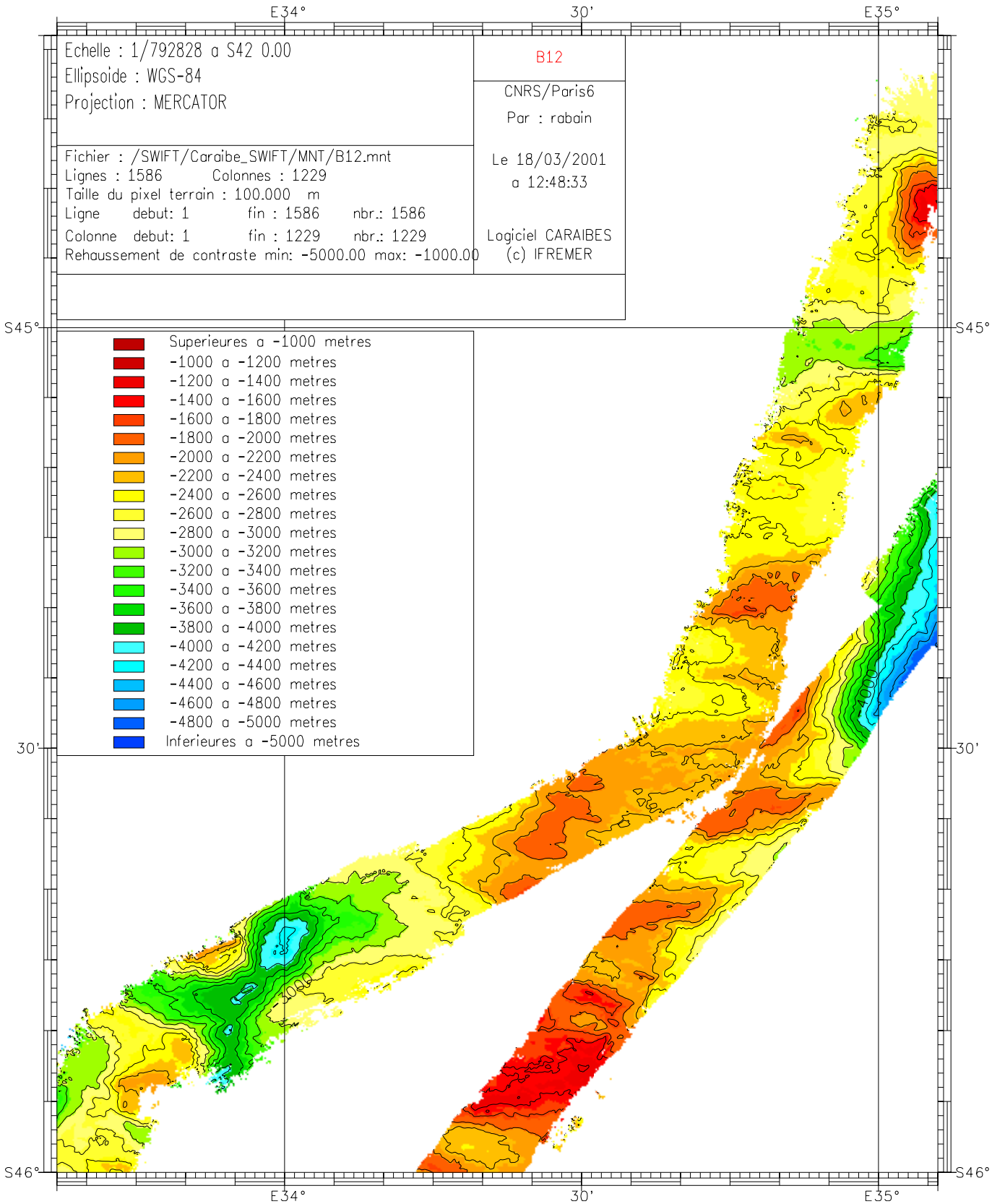
SWIFT
14 février - 21 mars 2001

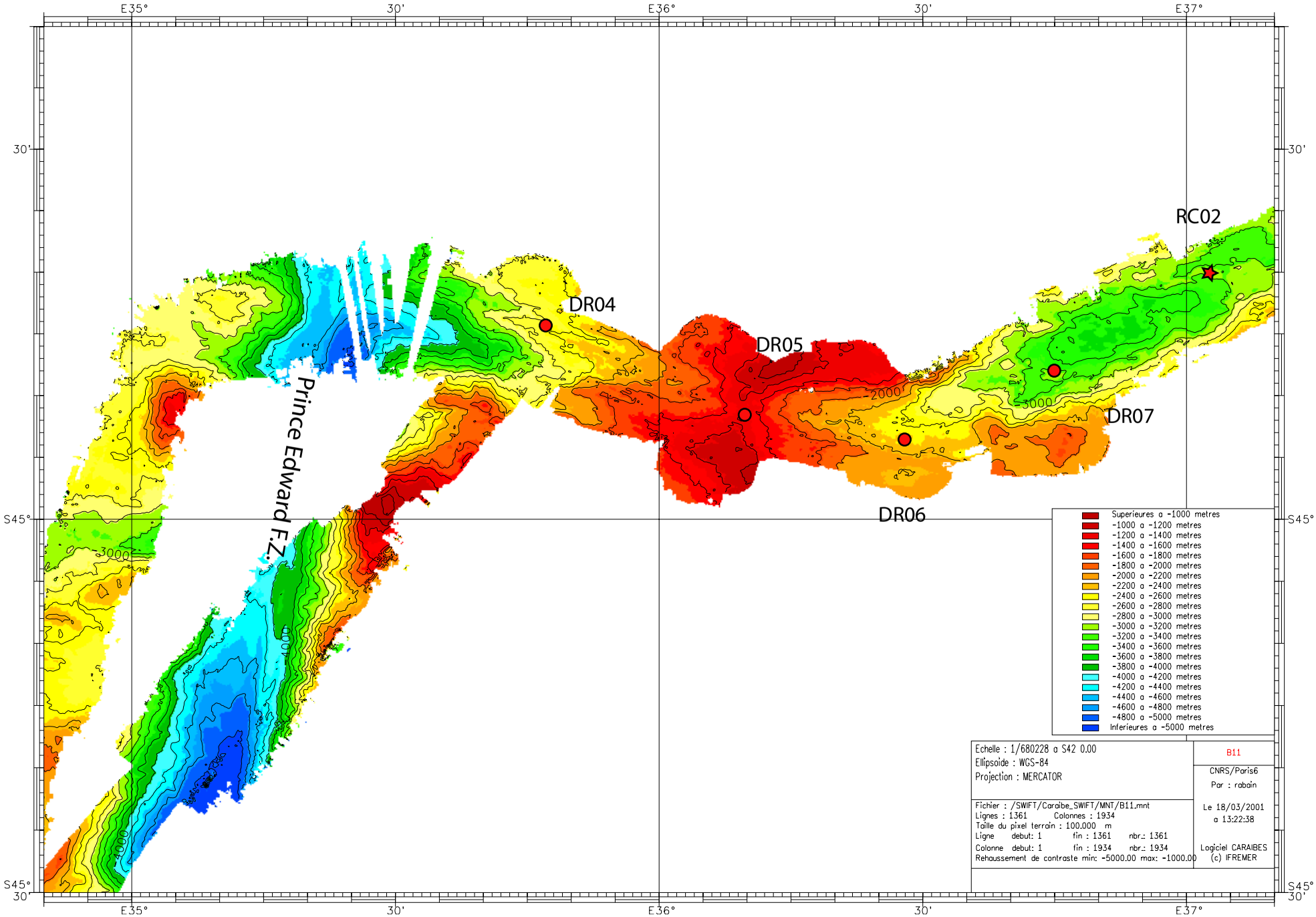


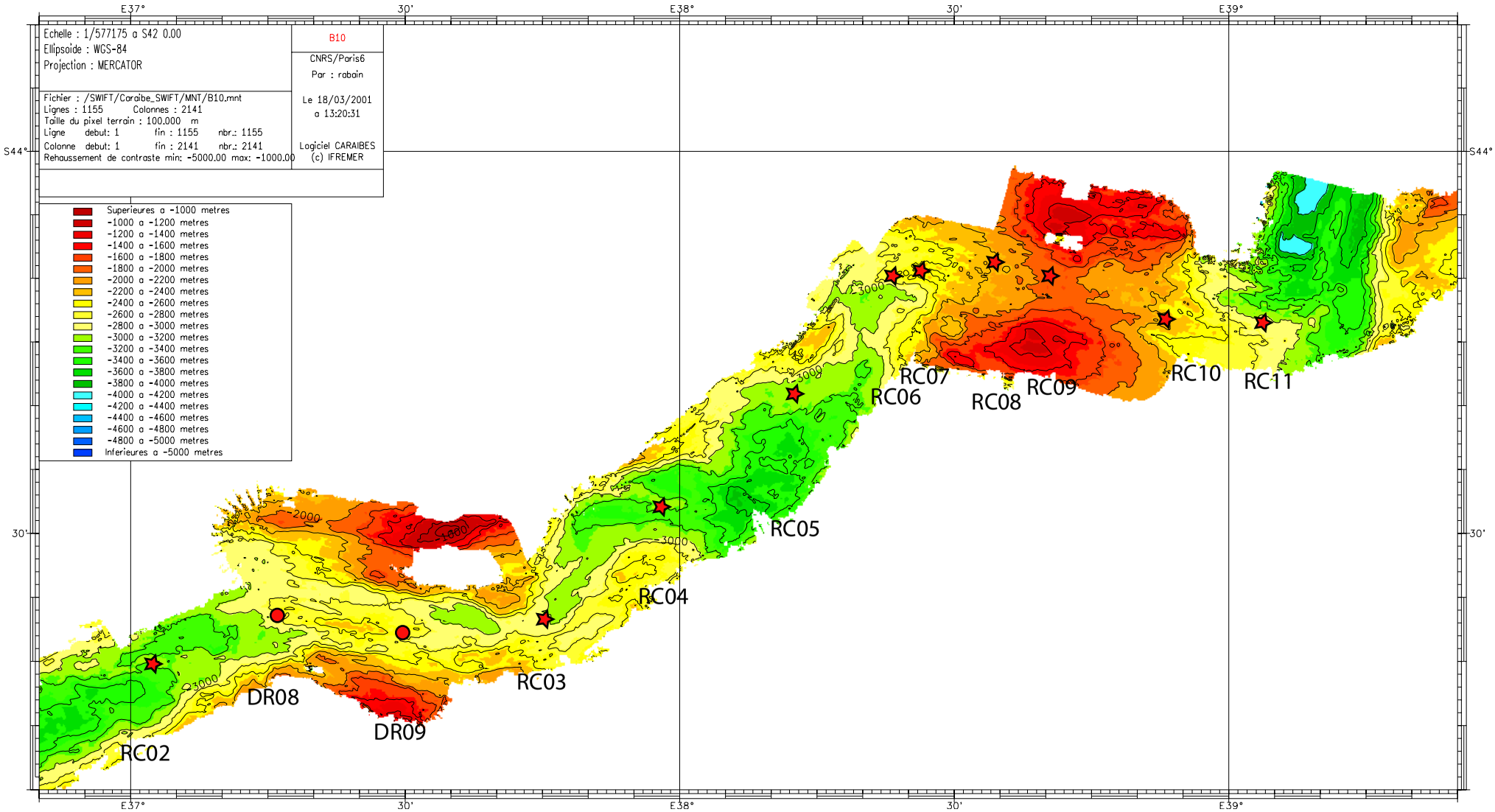

Rock Core
Dredges - *Dragues:*
Basalt - *Basalte*
Gabbro/dolerite - *Gabbro/dolérite*
Peridotite/serpentinite - *Péridotite/serpentinite*
Empty - *vide*
B02
B03
B04
B05
B06
B07North
B07
B08
B09
B10
B11
LigFlu
crozet
E35° 30' E36° 30' E37° 30' E38° 30' E39° 30' E40° 30' E41° 30' E42° 30' E43° 30' E44° 30' E45° 30' E46° 30' E47° 30' E48° 30' E49° 30'
S37° 30' S38° 30' S39° 30' S40° 30' S41° 30' S42° 30' S43° 30' S44° 30' S45° 30'

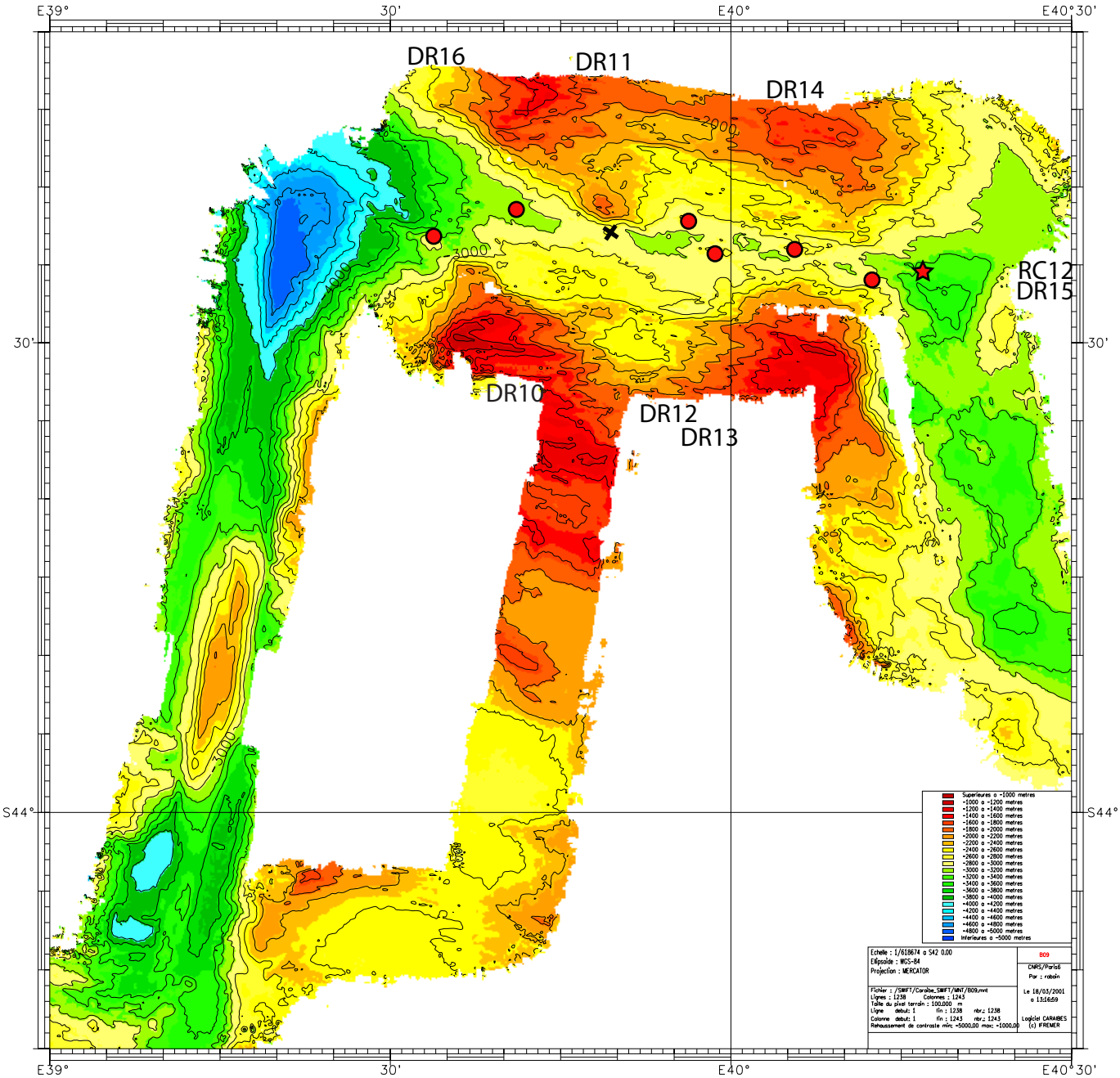

30'
E33°
30'
E34°
30'
S47°
-3000
-4000
-2000
-2000
-2000
-3000
DR01
DR02&03
TNT
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
Echelle : 1/603646 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
Fichier : /SWIFT/Caraibe_SWIFT/MNT/B14.mnt
Lignes : 1208 Colonnes : 1450
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 1208 nbr.: 1208
Colonne debut: 1 fin : 1450 nbr.: 1450
Rehaussement de contraste min: -5000.00 max: -1000.00
CNRS/Paris6
Par : rabain
Le 18/03/2001
a 12:46:16
Logiciel CARAIBES
(c) IFREMER

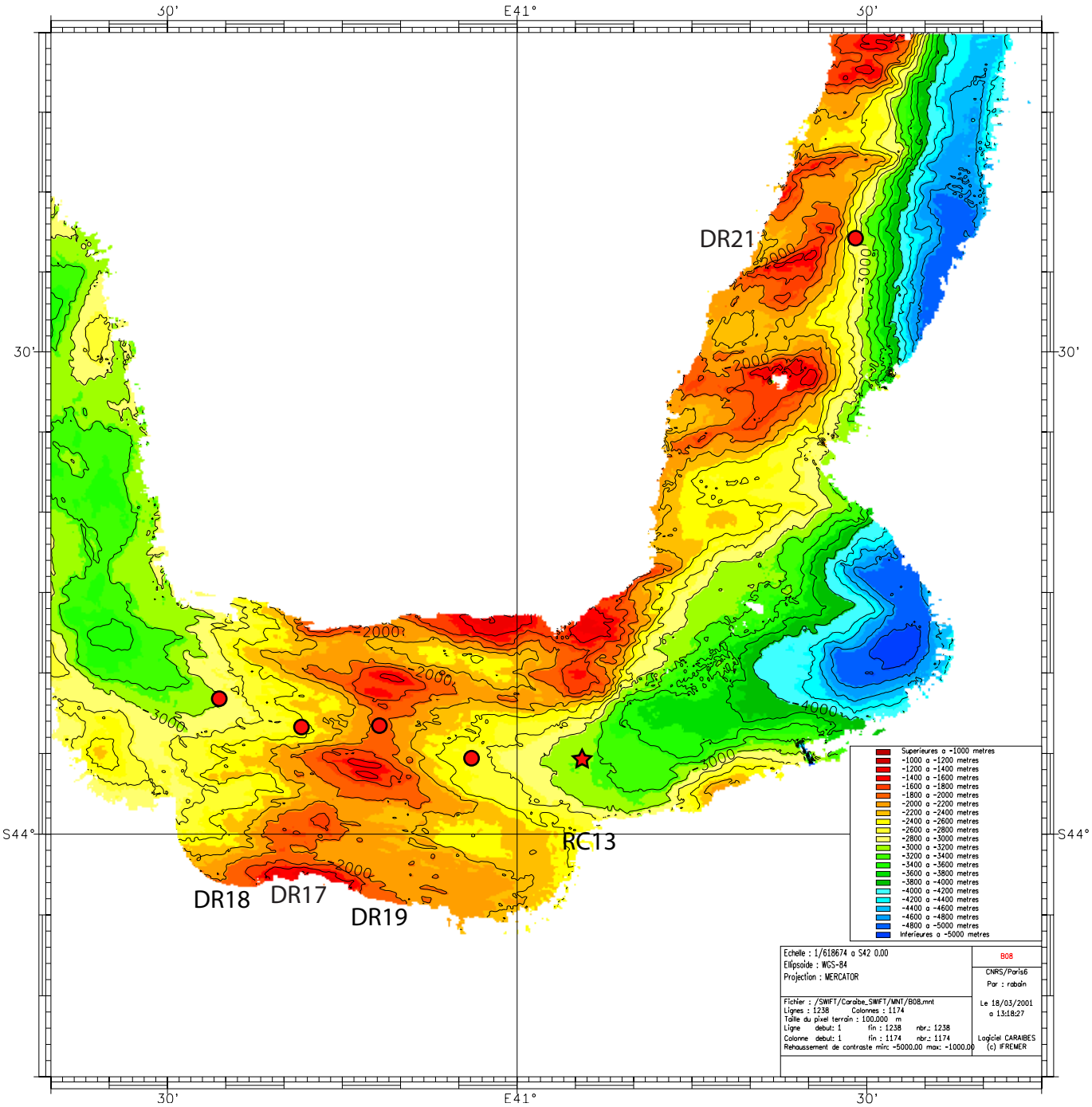

E33°10'
20'
E33°30'
40'
50'
E34°
10'
20'
E34°30'
S45°
50'
S46°
10'
20'
30'
RC01
-2000
-3000
-4000
-5000
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
Echelle : 1/397486 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
B13
CNRS/Paris6
Par : rabain
Fichier : /SWIFT/Caraibe_SWIFT/MNT/B13.mnt
Lignes : 795 Colonnes : 1243
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 795 nbr.: 795
Colonne debut: 1 fin : 1243 nbr.: 1243
Rehaussement de contraste min: -5000.00 max: -1000.00
Le 18/03/2001
a 12:49:44
Logiciel CARAIBES
(c) IFREMER

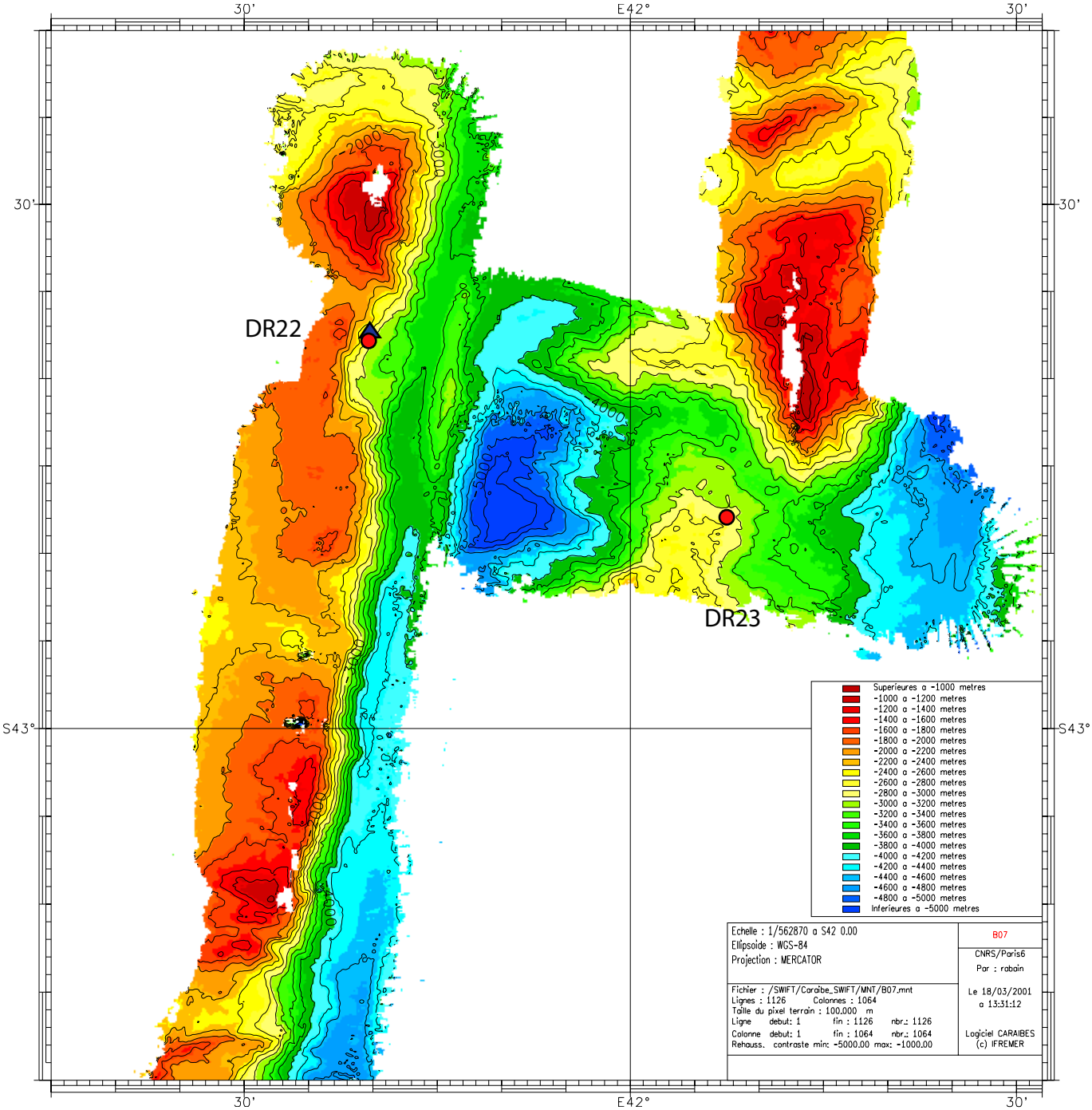

E34°
30'
E35°
Echelle : 1/792828 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
B12
CNRS/Paris6
Par : rabain
Le 18/03/2001
a 12:48:33
Fichier : /SWIFT/Caraibe_SWIFT/MNT/B12.mnt
Lignes : 1586 Colonnes : 1229
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 1586 nbr.: 1586
Colonne debut: 1 fin : 1229 nbr.: 1229
Rehaussement de contraste min: -5000.00 max: -1000.00
Logiciel CARAIBES
(c) IFREMER
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
S45°
30'
S46°
-3000
-4000

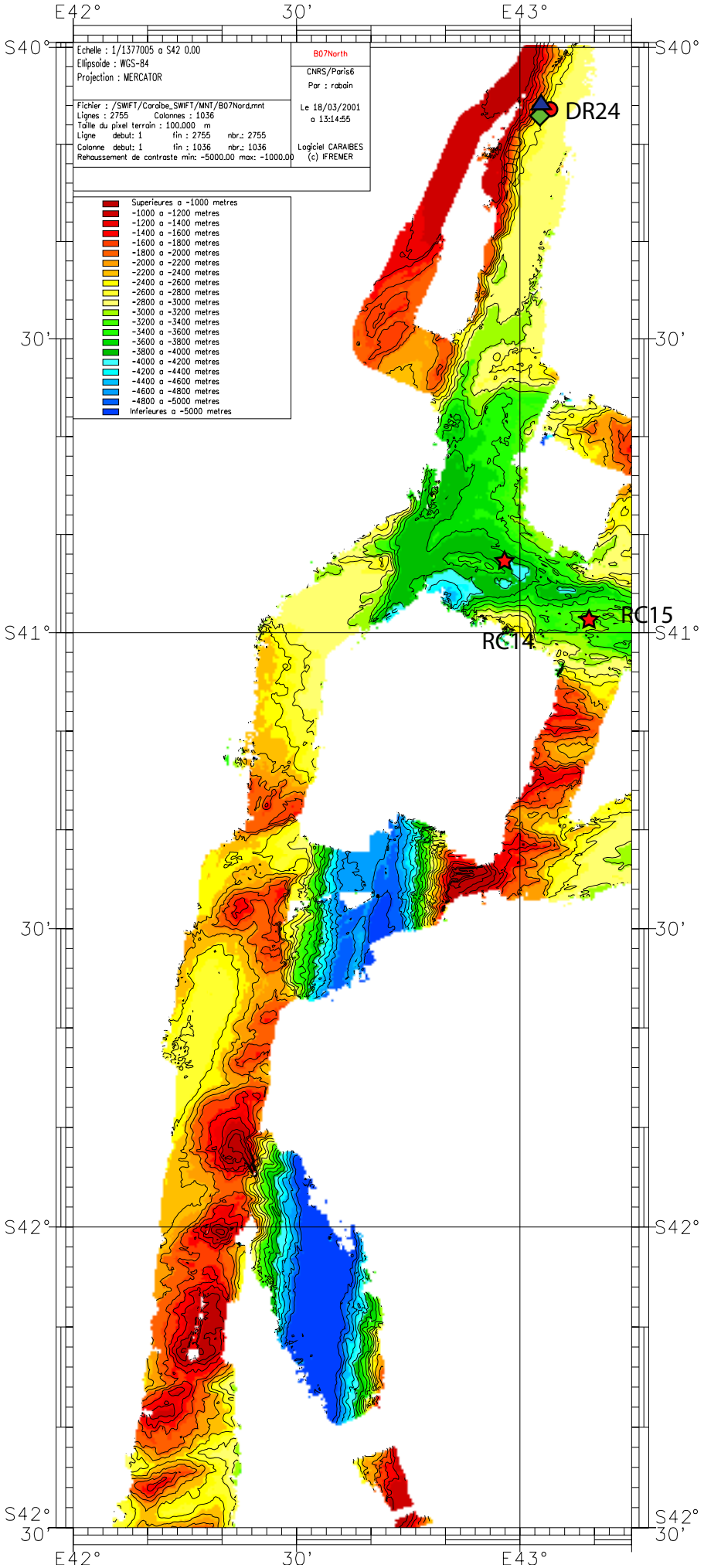

E35°
30'
E36°
30'
E37°
S45°
30'
RC02
DR04
DR05
DR06
DR07
Prince Edward F.Z.
-2000
-3000
-4000
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
Echelle : 1/680228 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
Fichier : /SWIFT/Caraibe_SWIFT/MNT/B11.mnt
Lignes : 1361 Colonnes : 1934
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 1361 nbr.: 1361
Colonne debut: 1 fin : 1934 nbr.: 1934
Rehaussement de contraste min: -5000.00 max: -1000.00
B11
CNRS/Paris6
Par : robain
Le 18/03/2001
a 13:22:38
Logiciel CARAIBES
(c) IFREMER

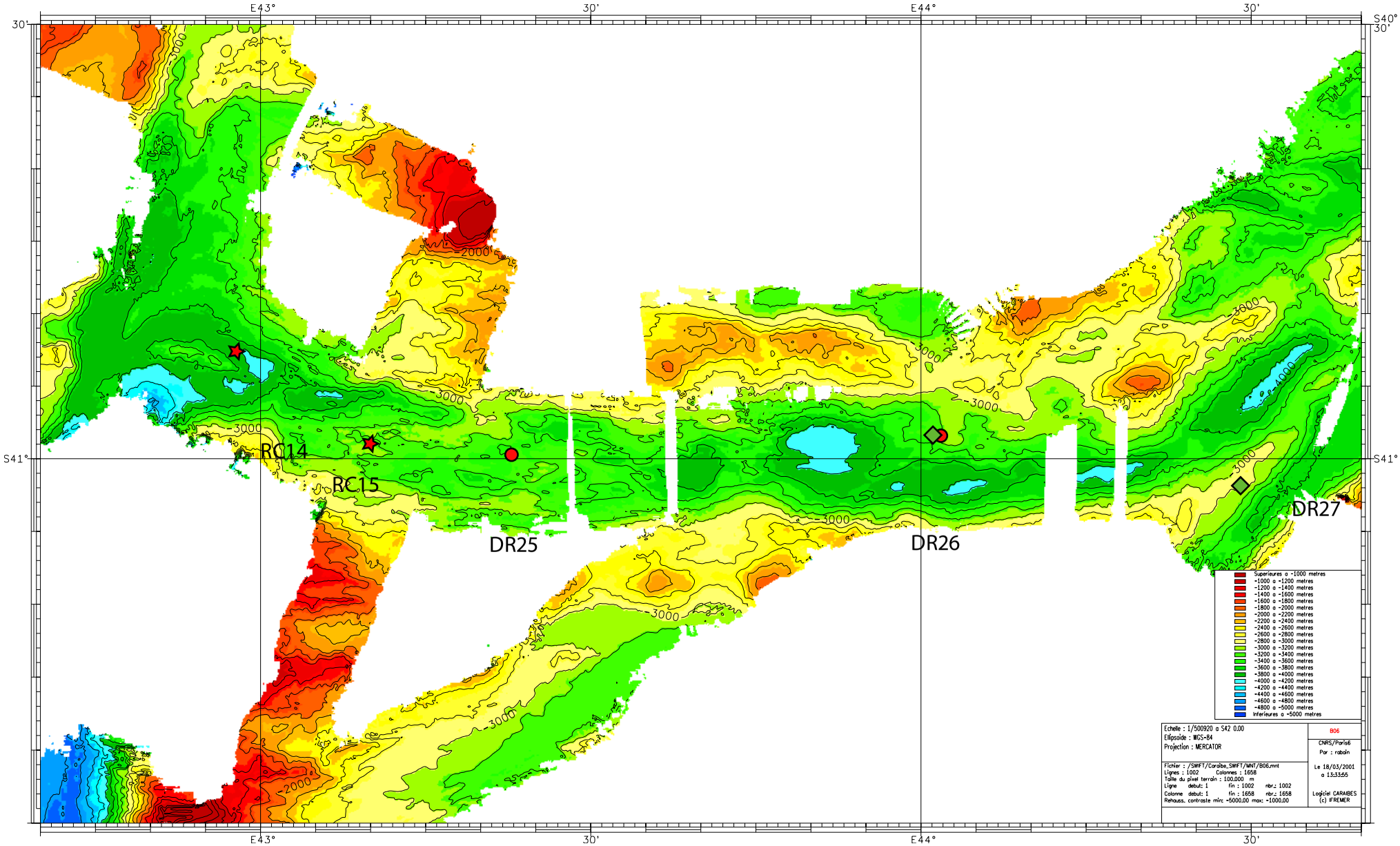

Echelle : 1/577175 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
Fichier : /SWIFT/Caraibe_SWIFT/MNT/B10.mnt
Lignes : 1155 Colonnes : 2141
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 1155 nbr.: 1155
Colonne debut: 1 fin : 2141 nbr.: 2141
Rehaussement de contraste min: -5000.00 max: -1000.00
B10
CNRS/Paris6
Par : robain
Le 18/03/2001
a 13:20:31
Logiciel CARAIBES
(c) IFREMER
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
E37°
30'
E38°
30'
E39°
S44°
30'
RC02
DR08
DR09
RC03
RC04
RC05
RC06
RC07
RC08
RC09
RC10
RC11
-1000
-2000
-3000

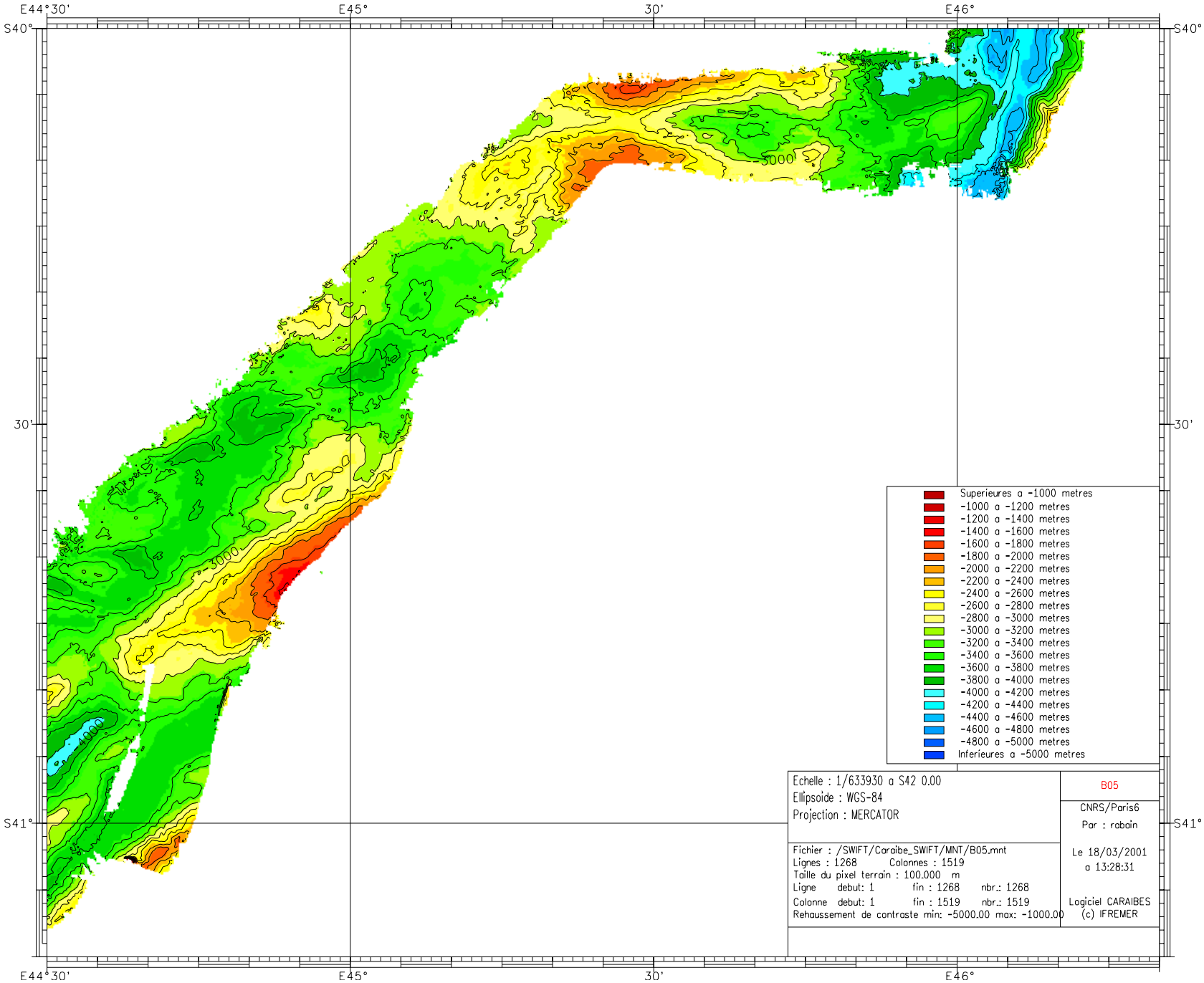

E39°
30'
E40°
E40°30'
30'
S44°
DR16
DR11
DR14
RC12
DR15
DR10
DR12
DR13
-3000
-4000
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
Echelle : 1/618674 a 542 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
B09
CNRS/Paris6
Par : robain
Fichier : /SWFT/Caraibe_SWFT/MNT/B09.mnt
Lignes : 1238 Colonnes : 1243
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 1238 nbr.: 1238
Colonne debut: 1 fin : 1243 nbr.: 1243
Rehaussement de contraste min: -5000.00 max: +1000.00
Le 18/03/2001
a 13:16:59
Logiciel CARAIBES
(c) IFREMER

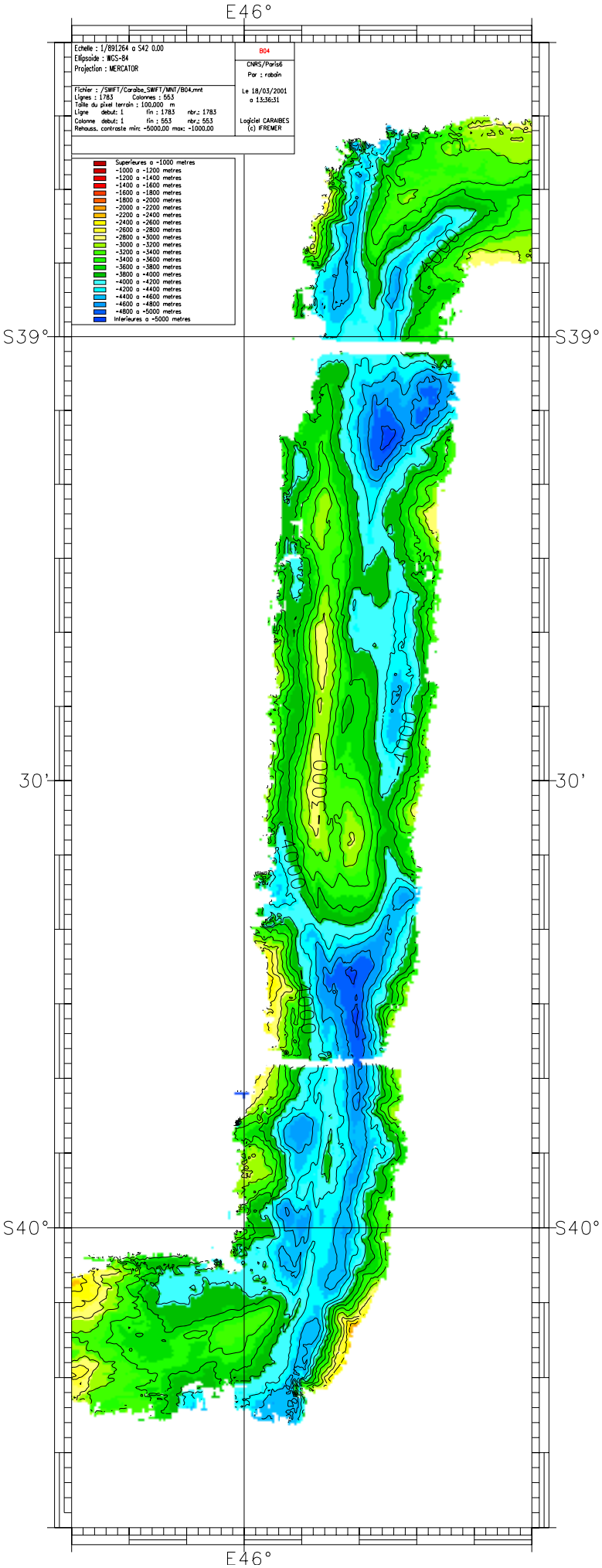

30'
E41°
30'
30'
30'
S44°
S44°
DR21
DR18
DR17
DR19
RC13
-2000
-3000
-4000
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
Echelle : 1/618674 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
B08
CNRS/Paris6
Par : rabain
Fichier : /SWIFT/Caraibe_SWIFT/MNT/B08.mnt
Lignes : 1238 Colonnes : 1174
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 1238 nbr.: 1238
Colonne debut: 1 fin : 1174 nbr.: 1174
Rehaussement de contraste minc -5000.00 max: -1000.00
Le 18/03/2001
a 13:18:27
Logiciel CARAIBES
(c) IFREMER

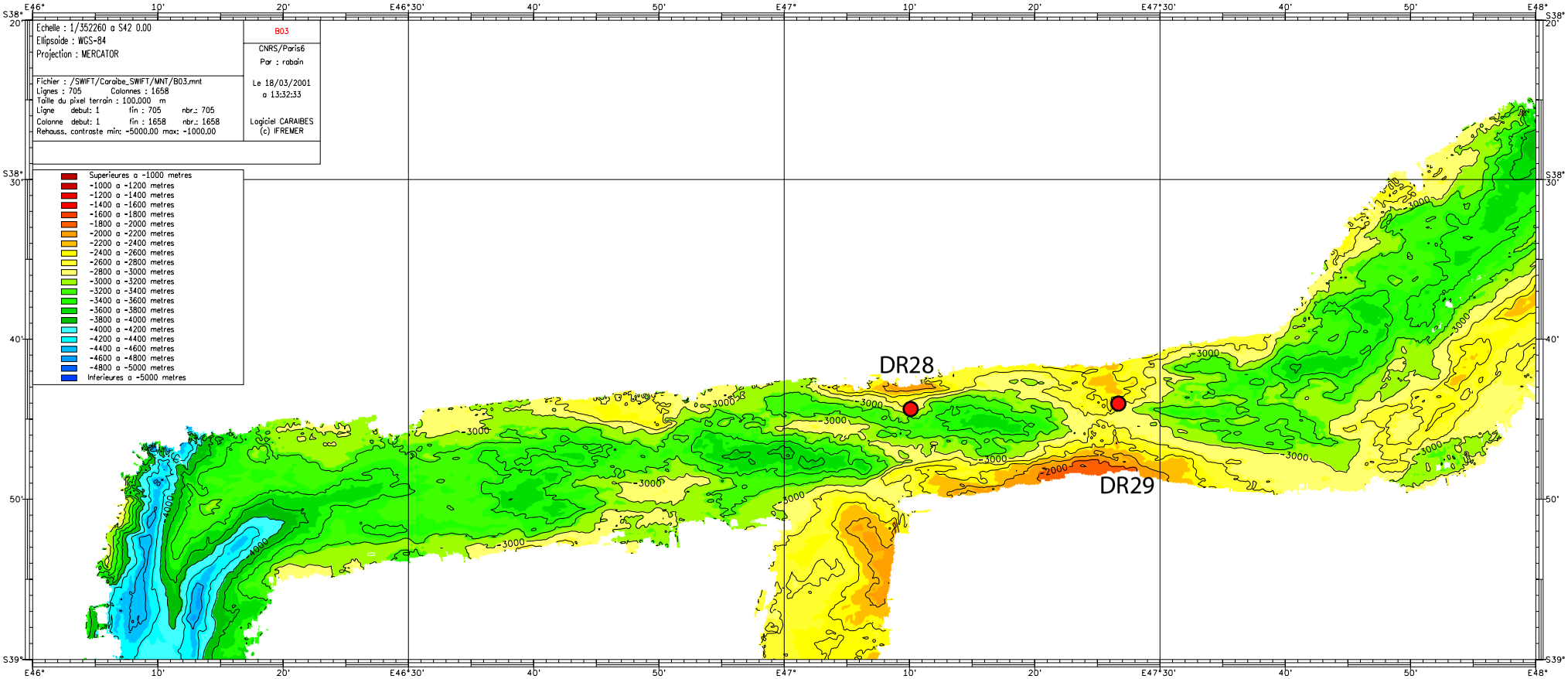

30'
E42°
30'
30'
30'
S43°
S43°
DR22
DR23
2000
3000
4000
5000
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
Echelle : 1/562870 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
Fichier : /SWIFT/Caraibe_SWIFT/MNT/B07.mnt
Lignes : 1126 Colonnes : 1064
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 1126 nbr.: 1126
Colonne debut: 1 fin : 1064 nbr.: 1064
Rehauss. contraste min: -5000.00 max: -1000.00
B07
CNRS/Paris6
Par : rabain
Le 18/03/2001
a 13:31:12
Logiciel CARAIBES
(c) IFREMER

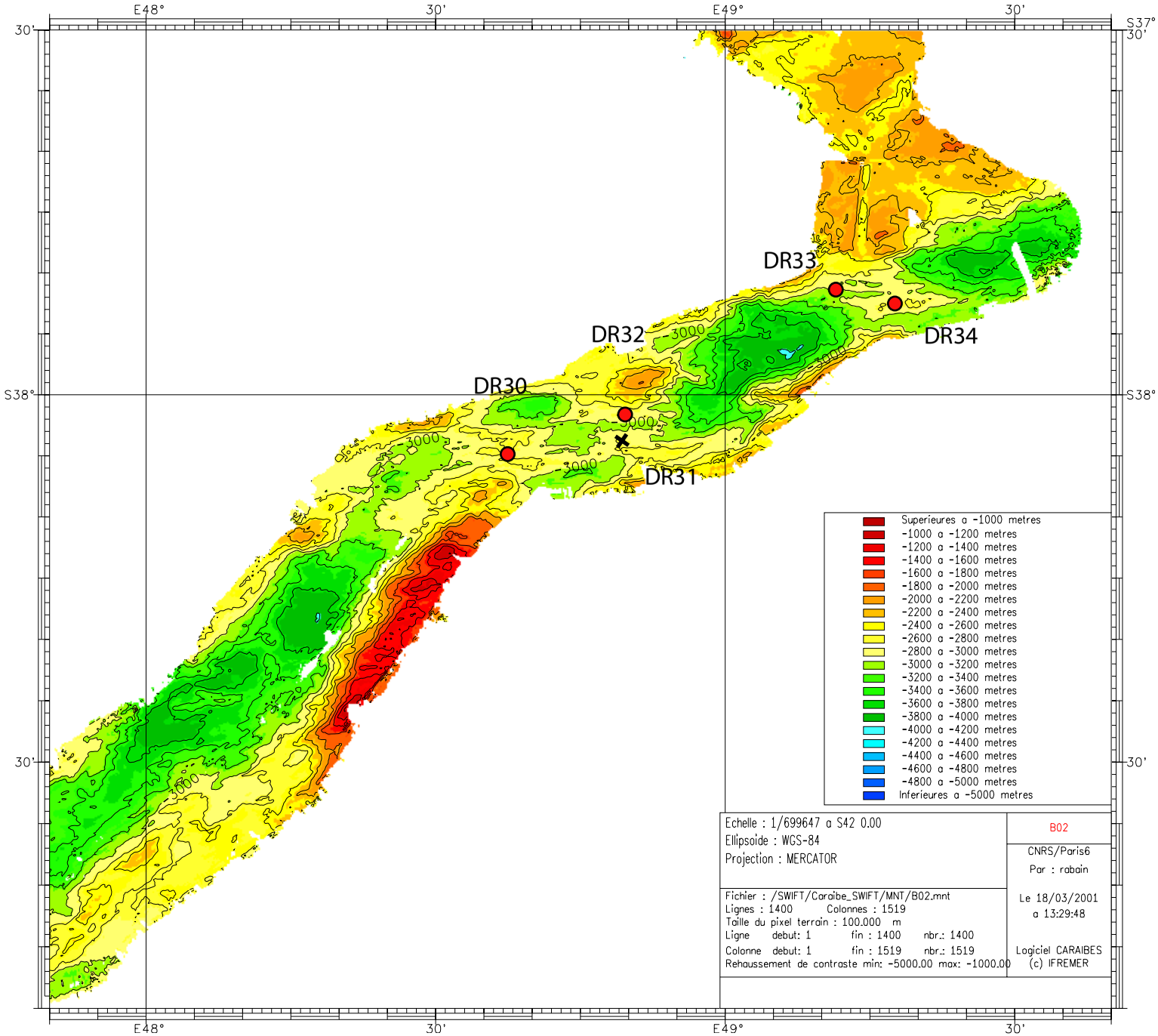

E42°
30'
E43°
S40°
30'
S41°
30'
S42°
S42°
30'
Echelle : 1/1377005 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
Fichier : /SWIFT/Caraibe_SWIFT/MNT/B07Nord.mnt
Lignes : 2755 Colonnes : 1036
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 2755 nbr.: 2755
Colonne debut: 1 fin : 1036 nbr.: 1036
Rehaussement de contraste min: -5000.00 max: -1000.00
B07North
CNRS/Paris6
Par : rabain
Le 18/03/2001
a 13:14:55
Logiciel CARAIBES
(c) IFREMER
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
DR24
RC15
RC14

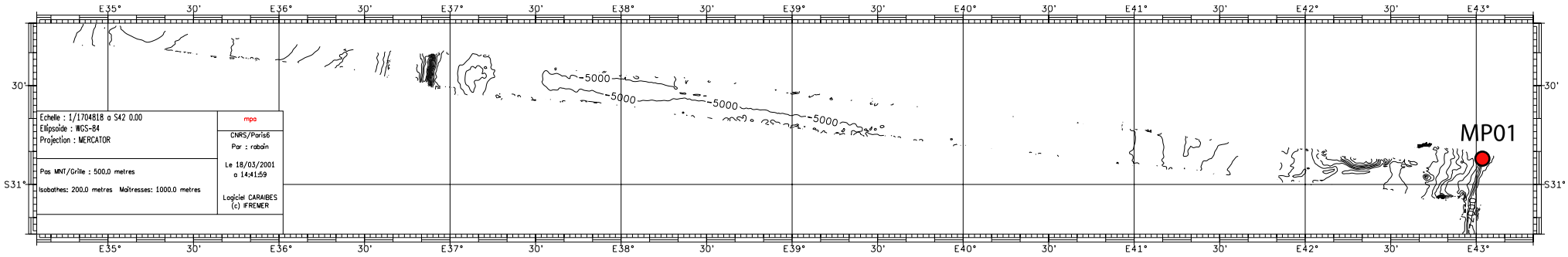

E43°
30'
E44°
30'
S40°
30'
S41°
RC14
RC15
DR25
DR26
DR27
-2000
-3000
-4000
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
Echelle : 1/500920 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
B06
CNRS/Paris6
Par : robain
Fichier : /SWFT/Caraibe_SWFT/MNT/B06.mnt
Lignes : 1002 Colonnes : 1658
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 1002 nbr.: 1002
Colonne debut: 1 fin : 1658 nbr.: 1658
Rehauss. contraste min: -5000.00 max: -1000.00
Le 18/03/2001
a 13:33:55
Logiciel CARAIBES
(c) IFREMER

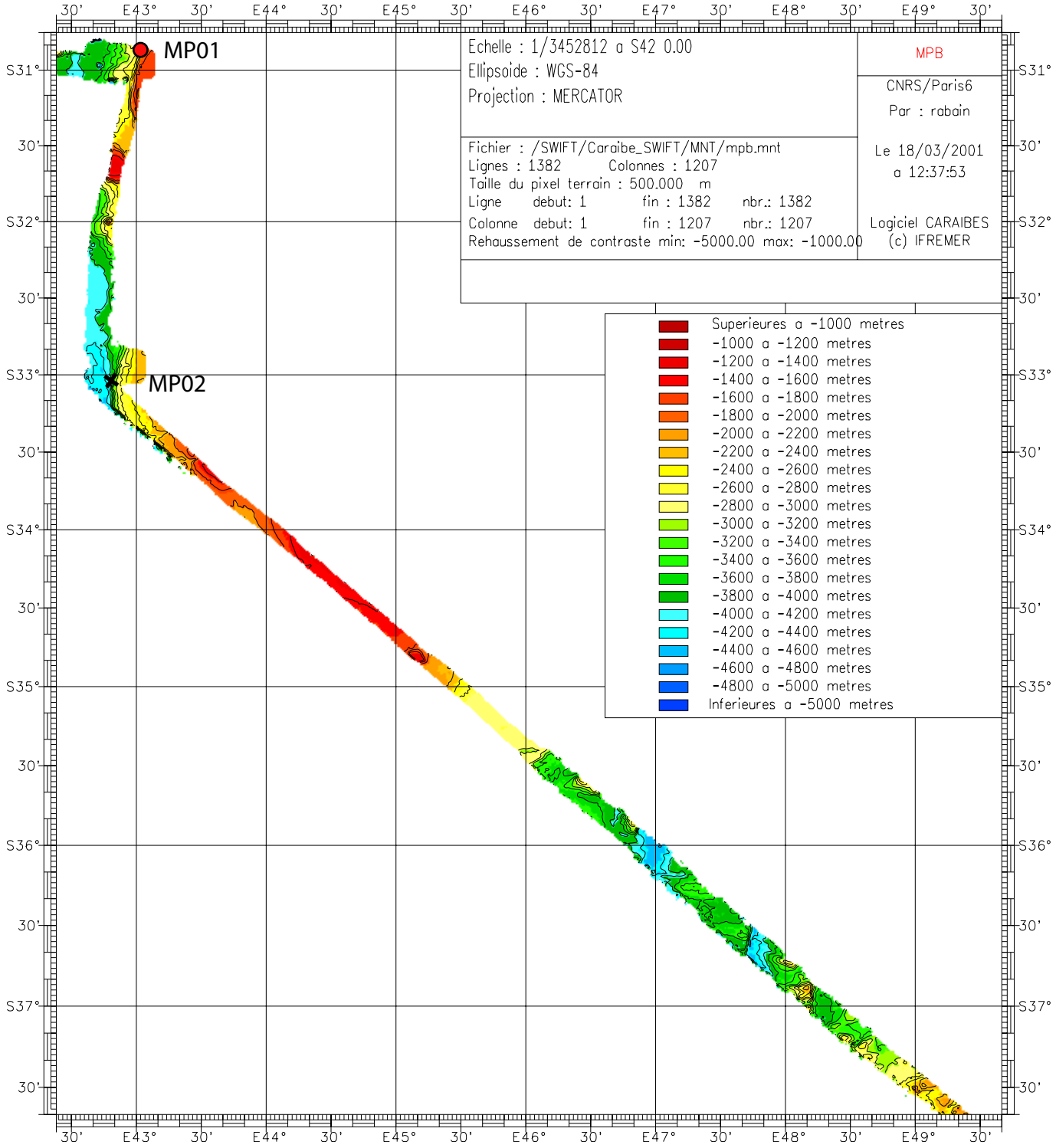

E44°30'
E45°
30'
E46°
S40°
30'
S41°
-3000
-4000
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
Echelle : 1/633930 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
Fichier : /SWIFT/Caraibe_SWIFT/MNT/B05.mnt
Lignes : 1268 Colonnes : 1519
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 1268 nbr.: 1268
Colonne debut: 1 fin : 1519 nbr.: 1519
Rehaussement de contraste min: -5000.00 max: -1000.00
B05
CNRS/Paris6
Par : rabain
Le 18/03/2001
a 13:28:31
Logiciel CARAIBES
(c) IFREMER

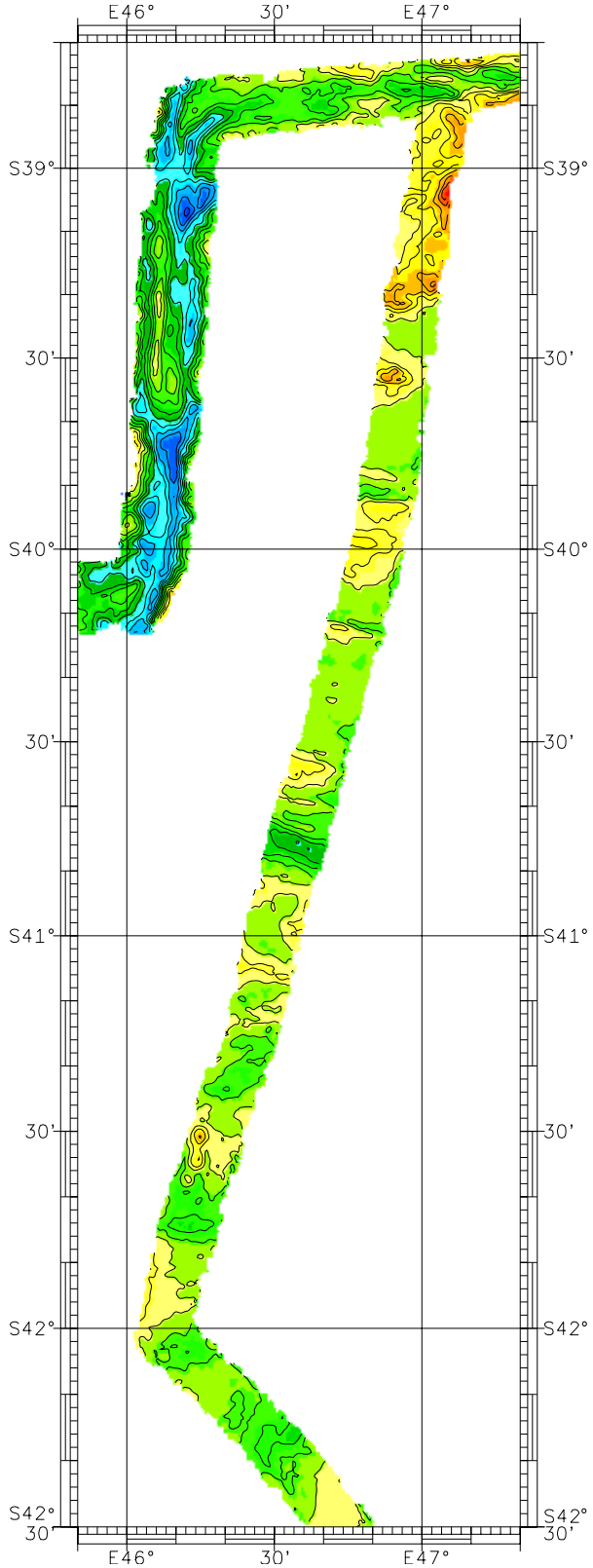

E46°
Echelle : 1/891264 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
Fichier : /SWIFT/Caraibe_SWIFT/MNT/B04.mnt
Lignes : 1783 Colonnes : 553
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 1783 nbr.: 1783
Colonne debut: 1 fin : 553 nbr.: 553
Rehauss. contraste min: -5000.00 max: -1000.00
B04
CNRS/Paris6
Par : robain
Le 18/03/2001
a 15:36:31
Logiciel CARAIBES
(c) IFREMER
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
S39°
S39°
30'
30'
S40°
S40°
-4000
-3000
-4000
-4000
E46°


Echelle : 1/352260 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
Fichier : /SWIFT/Caraibe_SWIFT/MNT/B03.mnt
Lignes : 705 Colonnes : 1658
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 705 nbr.: 705
Colonne debut: 1 fin : 1658 nbr.: 1658
Rehauss. contraste min: -5000.00 max: -1000.00
B03
CNRS/Paris6
Par : rabain
Le 18/03/2001
a 13:32:33
Logiciel CARAIBES
(c) IFREMER
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
DR28
DR29
E46°
10'
20'
E46°30'
40'
50'
E47°
E47°30'
E48°
S38°
S39°


E48°
30'
E49°
30'
S37°
30'
S38°
30'
DR33
DR34
DR32
DR30
DR31
-3000
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
Echelle : 1/699647 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
B02
CNRS/Paris6
Par : rabain
Fichier : /SWIFT/Caraibe_SWIFT/MNT/B02.mnt
Lignes : 1400 Colonnes : 1519
Taille du pixel terrain : 100.000 m
Ligne debut: 1 fin : 1400 nbr.: 1400
Colonne debut: 1 fin : 1519 nbr.: 1519
Rehaussement de contraste min: -5000.00 max: -1000.00
Le 18/03/2001
a 13:29:48
Logiciel CARAIBES
(c) IFREMER


E35°
30'
E36°
30'
E37°
30'
E38°
30'
E39°
30'
E40°
30'
E41°
30'
E42°
30'
E43°
30'
S31°
-5000
-5000
-5000
-5000
MP01
Echelle : 1/1704818 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
Pas MNT/Grille : 500.0 metres
Isobathes: 200.0 metres Maitresses: 1000.0 metres
mpa
CNRS/Paris6
Par : robain
Le 18/03/2001
a 14:41:59
Logiciel CARAIBES
(c) IFREMER


MP01
MP02
Echelle : 1/3452812 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
Fichier : /SWIFT/Caraibe_SWIFT/MNT/mpb.mnt
Lignes : 1382 Colonnes : 1207
Taille du pixel terrain : 500.000 m
Ligne debut: 1 fin : 1382 nbr.: 1382
Colonne debut: 1 fin : 1207 nbr.: 1207
Rehaussement de contraste min: -5000.00 max: -1000.00
MPB
CNRS/Paris6
Par : rabain
Le 18/03/2001
a 12:37:53
Logiciel CARAIBES
(c) IFREMER
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
30' E43° 30' E44° 30' E45° 30' E46° 30' E47° 30' E48° 30' E49° 30'
S31° 30' S32° 30' S33° 30' S34° 30' S35° 30' S36° 30' S37° 30'



- Superieures a -1000 metres
- -1000 a -1200 metres
- -1200 a -1400 metres
- -1400 a -1600 metres
- -1600 a -1800 metres
- -1800 a -2000 metres
- -2000 a -2200 metres
- -2200 a -2400 metres
- -2400 a -2600 metres
- -2600 a -2800 metres
- -2800 a -3000 metres
- -3000 a -3200 metres
- -3200 a -3400 metres
- -3400 a -3600 metres
- -3600 a -3800 metres
- -3800 a -4000 metres
- -4000 a -4200 metres
- -4200 a -4400 metres
- -4400 a -4600 metres
- -4600 a -4800 metres
- -4800 a -5000 metres
- Inferieures a -5000 metres

Echelle : 1/2083790 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR

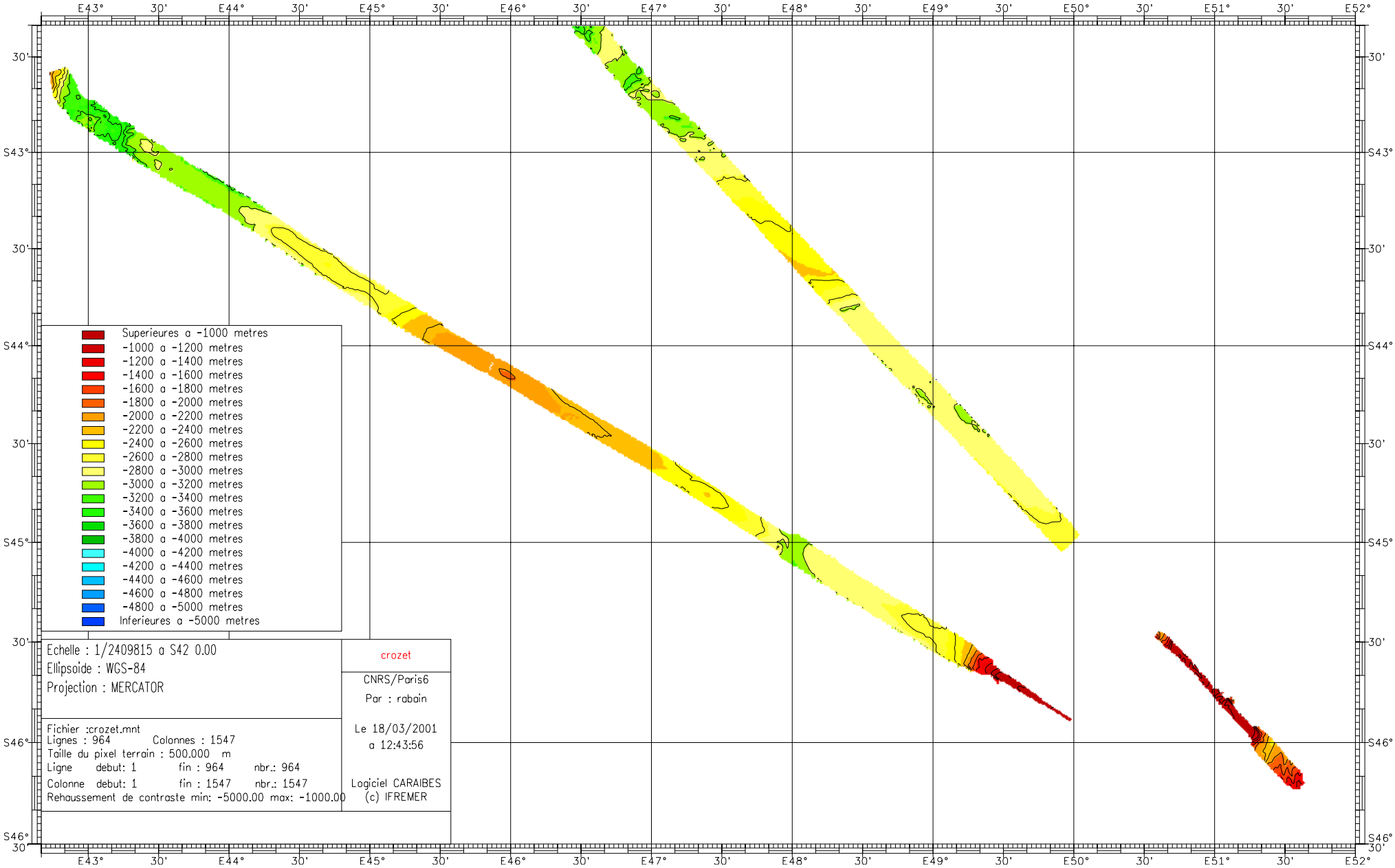
LigFlu

CNRS/Paris6
Par : rabain

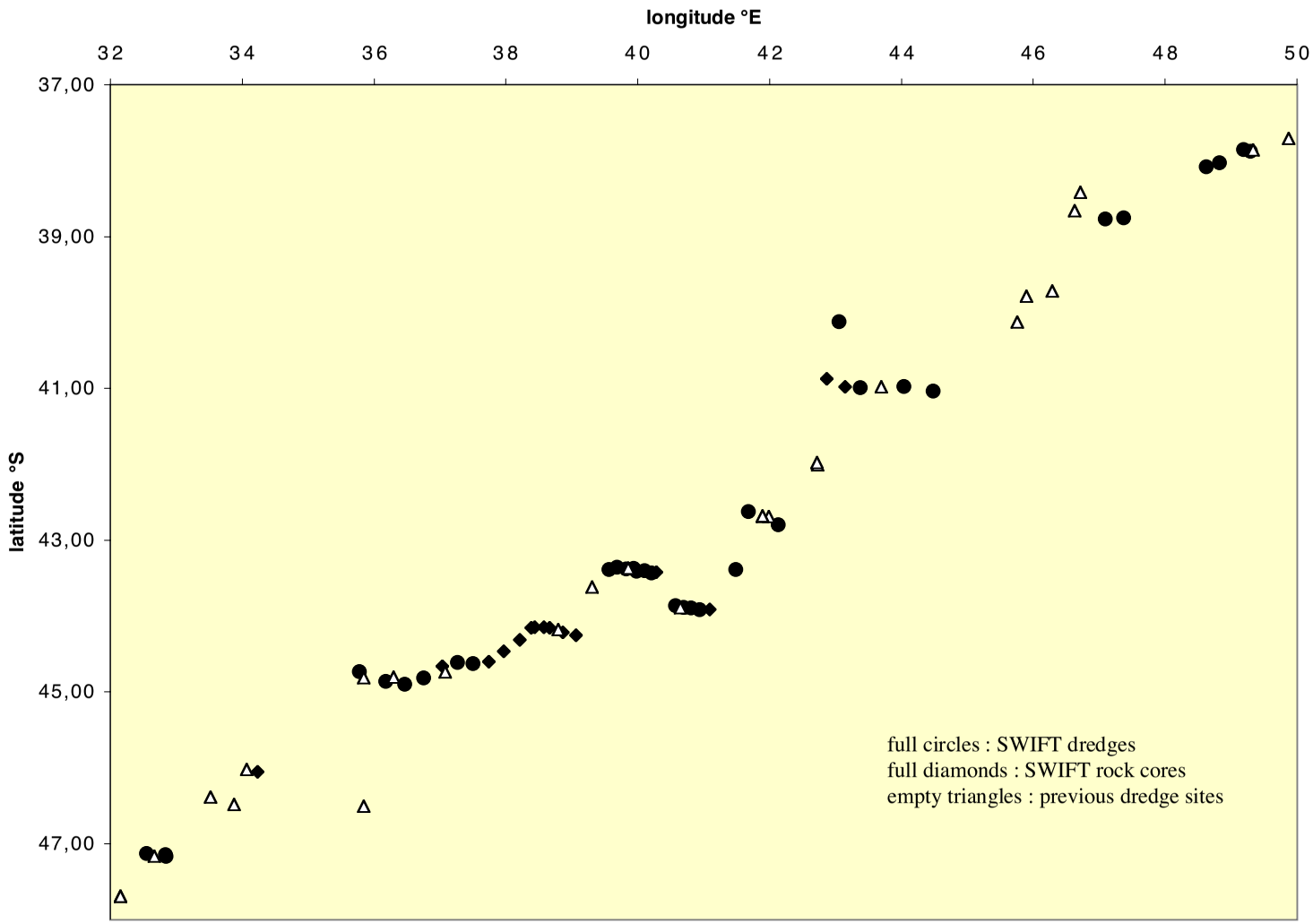
Le 18/03/2001
a 12:41:31

Fichier : /SWIFT/Caraibe_SWIFT/MNT/LigFlu.mnt
Lignes : 834 Colonnes : 249
Taille du pixel terrain : 500.000 m
Ligne debut: 1 fin : 834 nbr.: 834
Colonne debut: 1 fin : 249 nbr.: 249
Rehaussement de contraste min: -5000.00 max: -1000.00

Logiciel CARAIBES
(c) IFREMER


E43° 30' E44° 30' E45° 30' E46° 30' E47° 30' E48° 30' E49° 30' E50° 30' E51° 30' E52°
30' S43° 30' S44° 30' S45° 30' S46° 30'
Superieures a -1000 metres
-1000 a -1200 metres
-1200 a -1400 metres
-1400 a -1600 metres
-1600 a -1800 metres
-1800 a -2000 metres
-2000 a -2200 metres
-2200 a -2400 metres
-2400 a -2600 metres
-2600 a -2800 metres
-2800 a -3000 metres
-3000 a -3200 metres
-3200 a -3400 metres
-3400 a -3600 metres
-3600 a -3800 metres
-3800 a -4000 metres
-4000 a -4200 metres
-4200 a -4400 metres
-4400 a -4600 metres
-4600 a -4800 metres
-4800 a -5000 metres
Inferieures a -5000 metres
Echelle : 1/2409815 a S42 0.00
Ellipsoide : WGS-84
Projection : MERCATOR
Fichier :crozet.mnt
Lignes : 964 Colonnes : 1547
Taille du pixel terrain : 500.000 m
Ligne debut: 1 fin : 964 nbr.: 964
Colonne debut: 1 fin : 1547 nbr.: 1547
Rehaussement de contraste min: -5000.00 max: -1000.00
crozet
CNRS/Paris6
Par : rabain
Le 18/03/2001
a 12:43:56
Logiciel CARAIBES
(c) IFREMER

Sample location - SWIFT



phenocrysts abundance in axial lavas

dredge	position, begining						position
#	lat	long	prof	type 1	type 2	type 3	in segment
DR01	47,13	32,55	3850	4,0	1,0		3
DR03	47,15	32,84	2320	4,0	0,0		1
DR04	44,73	35,78	2750	1,0	1,0		3
DR05	44,86	36,18	1320	4,0	1,0		1
DR06	44,90	36,47	2400	0,0	2,5		3
DR07	44,82	36,75	3270	0,5			4
DR08	44,61	37,27	2850	3,0	0,0		3
DR09	44,63	37,50	2730	2,5			1
DR10	43,36	39,69	3120	3,0			2
DR12	43,37	39,94	2860	4,0			1
DR13	43,41	39,98	2880	0,0			2
DR14	43,40	40,10	2770	0,0		3	2
DR15	43,43	40,21	3000	4,0	0,0		3
DR16	43,39	39,57	3100	3,0	0,0		3
DR17	43,89	40,70	2550	4,0			2
DR18	43,86	40,58	3000	0,0			3
DR19	43,89	40,81	1970	4,0			1
DR20	43,92	40,94	2700	4,0			2
DR23	42,80	42,13	2900	0,0			1
DR25	41,00	43,38	3350	0,0			1
DR28	38,77	47,09	3000	4,0			1
DR29	38,75	47,37	3040	0,0			1
DR30	38,08	48,62	2760	0,0			1
DR32	38,03	48,83	2760	0,0			2
DR33	37,86	49,19	3000	3,0			2
DR34	37,88	49,29	2750	4,0	2,0		1

visual estimation
phenocrysts are mostly plagioclase
rare olivine and exceptional cpx have been observed
plagioclase phenocrysts are often unevenly distributed, concentrated in the outer rim.

0 = aphyric
1 = <2%
2 = 2-5%
3 = 5-10%
4 = >10%

position in segment
center = 1
flank = 2
end = 3
discontinuity = 4