Geophysical Research Letters

Supporting Information for

On the early fate of hydrothermal iron at deep-sea vents: a reassessment after in-situ filtration

M. Waeles[1], L. Cotte[1,2], B. Pernet-Coudrier[1], V. Chavagnac[3], C. Cathalot[4], T. Leleu[3], A. Laës-Huon[5], A. Perhirin[2], R. D. Riso[1] and P.-M. Sarradin[2]

[1]Université de Bretagne Occidental, LEMAR UMR-CNRS 6539, IUEM, place Copernic, 29280 Plouzané, France, [2]Ifremer, Environnement Profond (DEEP-REM), ZI de la Pointe du Diable, CS 10070, 29280 Plouzané, France, [3]Laboratoire Géosciences Environnement Toulouse, Université de Toulouse, 31400 Toulouse, France, [4]Ifremer, Géochimie et Métallogénie (GM-REM), ZI de la Pointe du Diable, CS 10070, 29280 Plouzané, France, [5]Ifremer, Laboratoire Détection, Capteurs et Mesures (REM/RDT), ZI de la Pointe du Diable, CS 10070, 29280 Plouzané, France

Contents of this file

Additional Supporting Information (Files uploaded separately)

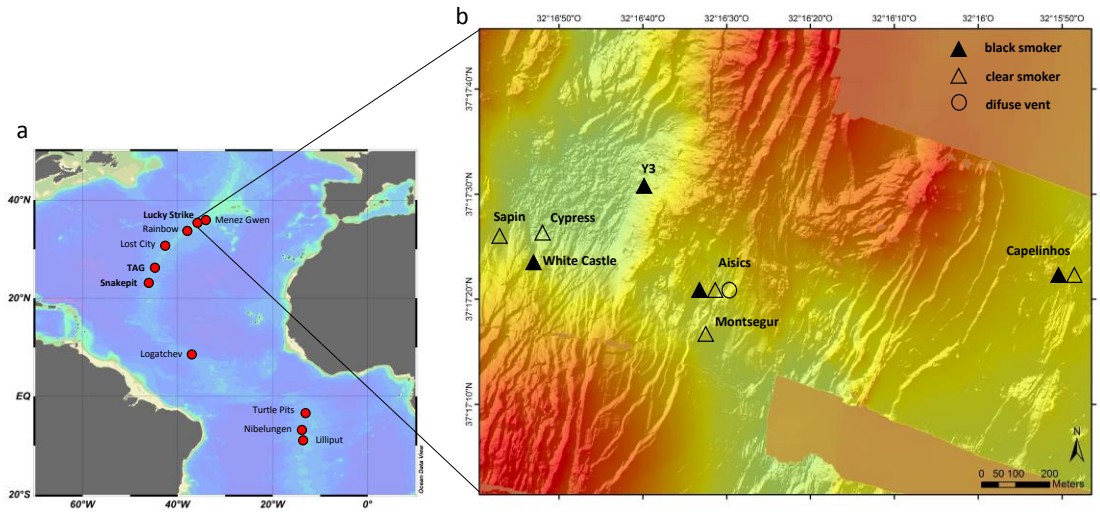

Figure S1. (a) Main known hydrothermal fields of the Mid-Atlantic Ridge. (b) Vent discharge sites of the Lucky Strike field where dissolved and particulate concentrations of Fe were measured after in-situ filtration.

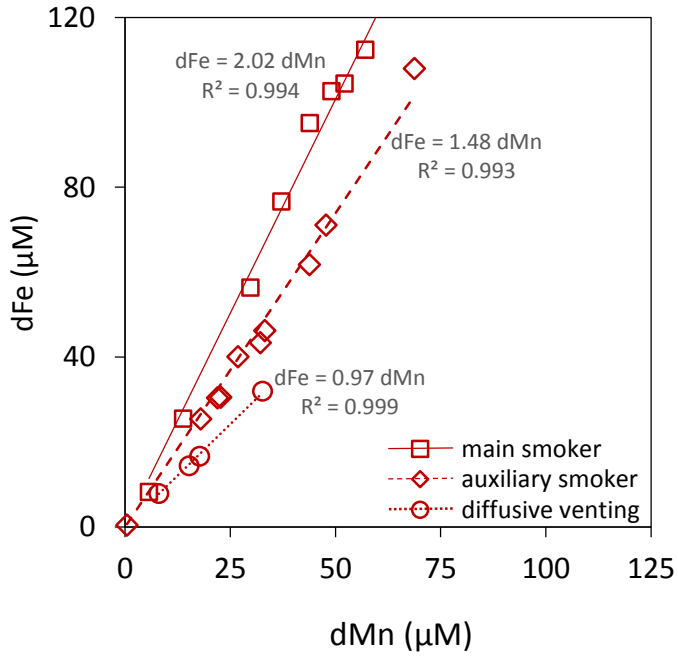

Figure S2. Dissolved Fe concentrations (dFe) as a function of dissolved Mn concentrations (dMn) at the main smoker, auxiliary smoker and diffusive smoker of Aisics.

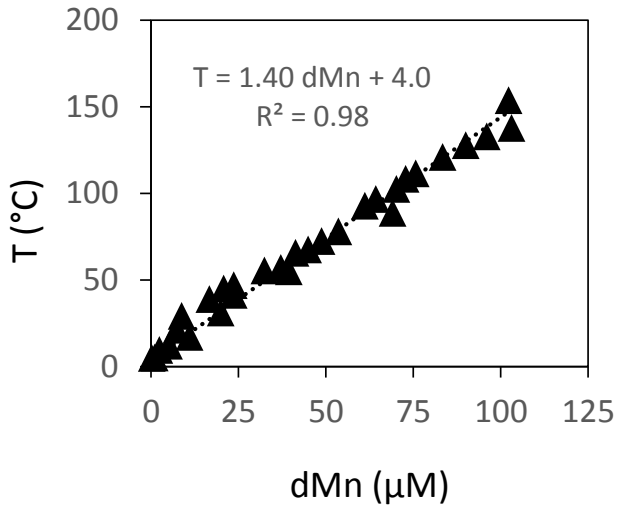

Figure S3. dMn-T relationship obtained at the main smoker of Aisics with the PEPITO sampler.

Site/Cruise	Depth (m)	dMn (nM)	dFe (nM)	pFe (nM)
TAG				
CD-77	3579	2.4	5.4	10
CD-77	3567	2.8	6.9	18
CD-77	3612	3.3	13	14
CD-77	3107	4.7	16	15
CD-77	3420	6	18	21
CD-77	3337	6.5	15	29
CD-77	3082	8.6	20	41
CD-77	3294	11	25	20
CD-77	3376	11	43	31
CD-77	3413	18	50	61
CD-77	3206	22	97	76
CD-77	3520	23	28	95
Geotraces GA03	3419	17.3	51	72
Geotraces GA03	3330	18.6	37	96
Geotraces GA03	3274	14.1	46	36
Geotraces GA03	3252	18.3	67	98
Snakepit				
CD-77	3455	1.4	6.3	6.5
CD-77	3305	3	7.3	18
CD-77	3340	3.6	13	12
CD-77	3376	4.6	15	9.1
CD-77	3351	5.8	24	8.3
CD-77	3372	7.5	20	22
CD-77	3363	7.8	20	19
CD-77	3384	10	24	15
CD-77	3364	11	35	20
CD-77	3348	13	34	19
CD-77	3354	18	42	16
CD-77	3371	24	47	34
CD-77	3335	32	87	69

Table S2. Dissolved and particulate Fe concentrations obtained in the neutrally buoyant plume of TAG and Snakepit. Data from cruise CD-77 are from James and Elderfield [1996]; data from cruise Geotraces-GA03 are from Hatta et al. [2015] and Ohnemus and Lam [2015]. A regression with the least square method with these data gives dFe+pFe=6.8 dMn (R^2=0.88) at TAG and dFe+pFe=4.3 dMn (R^2=0.89) at Snakepit. When compared to the Fe:Mn ratio of their relative well-focused black smoker source, i.e. 8.0 at TAG and 5.7 at Snakepit [James and Elderfield, 1996], about 15% and 25% of Fe is "missing" in the neutrally buoyant plumes of TAG and Snakepit, respectively.

T (°C)	dMn (µM)	dFe(µM)	pFe (µM)	dCu (µM)	pCu (µM)	dZn (µM)	pZn (µM)
12	5.68	8.29	0.56	0.037	0.13	0.64	0.20
27	13.75	25.55	2.12	0.028	1.11	0.381	1.74
52	29.82	56.39	1.63	0.057	1.43	0.487	1.15
62	37.13	76.69	4.51	0.068	2.57	0.290	3.25
69	43.90	95.14	2.97	0.073	2.97	0.254	4.96
90	49.03	102.7	5.59	0.022	4.00	0.095	5.42
82	52.12	104.5	5.28	0.278	4.44	0.447	6.60
103	57.04	112.4	4.84	0.090	3.53	0.175	5.49
127	88.13	188.1	6.36	0.158	5.47	0.200	7.83
158	104.2	199.0	8.37	0.207	5.89	0.234	8.61

Table S3. Dissolved and particulate Fe, Zn and Cu concentrations measured at the main smoker of Aisics (26 July 2014).

T (°C)	ΣS (µM)	T (°C)	Fe(II)
4.1	12.8	4.6	1.30
5.2	0.98	9.6	6.23
9.5	1.70	20.5	12.5
12.1	5.29	27.6	21.0
17.2	27.7	39.1	31.2
21.9	7.28	44.9	43.8
26.1	40.5	64.8	48.7
31.1	62.6	100.7	94.4
39.1	89.4		
41.4	132.4		
47.0	138.1		
52.6	120.7		
57.6	118.5		
63.9	125.3		
78.0	184.6		
85.7	124.6		
90.9	134.2		
97.1	171.8		
107.0	185.5		
108.5	191.4		
121.0	168.9		
131.0	205.4		
132.9	173.4		
153.8	186.9		

Table S4. Labile sulfide (ΣS) and Fe(II) data obtained at the main smoker of Aisics after in situ measurements with the CHEMINI analyser

Data Set S1. dissolved Mn (dMn), dissolved Fe (dFe) and particualte Fe (pFe) data at each sampled gradient. Mean temperature during each sampling (T) is also given but can be only use as an indicative value due to important variations in this dynamic area (see Cotte et al., [2015]). Parameters of the regressions with the least squares method to the one parameter linear dFe=a×dMn and pFe=b×dMn models are also displayed. a/(a+b) ratio correspond to the Fe fraction being preserved as dissolved species upon mixing. Uncertainties on the a/(a+b) ratio were deduced from confidence intervals at 95% on a and b.

Table S1. Overview of the hydrothermal vent gradients being sampled. The dilution factor range of each examined gradient was determined from the comparison of Mn concentrations in the gradient to Mn end-member concentrations (Table 1).