SYNTHESIS QUALITY OVERVIEW DOCUMENT (SQO)

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CHANGE RECORD

When the quality of the products changes, the QuID is updated and the SQO is updated. A line is added to this table and the version of the SQO document is the same than that of the REFERENCE QUID. The third column specifies which sections or sub-sections have been updated.

Issue	Date	§	Description of Change	Authors	Validated By
1.9	17/06/2020	All	Creation of the document	Tanguy Szekely	
1.10	14/09/2020	All	Update	Tanguy Szekely	
1.11	07/07/2021	All	Update	Tanguy Szekely	
1.12	17/02/2022	All	Update	Tanguy Szekely	S. Tarot
1.13	25/08/2022	All	Product and dataset name change Dataset full reprocessing	Tanguy Szekely	S. Tarot
1.14	31/08/2023	All	Dataset Update	Tanguy Szekely	S. Tarot

Contents

Executive summary

The quality of the INSITU_GLO_PHY_TS_DISCRETE_MY_013_001 product from the Copernicus Marine Service distribution is assessed through the horizontal and vertical data coverage along time for the following variables:

- TEMP (in situ temperature. Units: Celsius degree)
- PSAL (in-situ practical salinity. Units: PSU)

The particularity of any oceanographic in-situ measurements dataset is that the horizontal and vertical coverage of the dataset varies strongly along time following the technological developments and the international cooperation on observations networks. One should thus ensure that both the vertical coverage and the horizontal coverage fit his needs in terms of sampled ocean variability scales before using the data. Metrics have consequently been developed to appreciate the vertical and horizontal coverage of the dataset for TEMP and PSAL variables.

Horizontal coverage: To compute this parameter, the ocean surface is divided in 3° latitude per 5°longitude grid cells. The parameter is estimated on a monthly basis as the mean percentage of ocean grid cells sampled by at least one temperature profile during the corresponding month. All estimates are performed for all In Situ TAC regions and 3 different time periods.

Vertical coverage: To compute this parameter, the ocean surface is divided in grid cells. The grid cells size is 3° latitude per 5° longitude for global and Arctic zones, and 2° longitude per 2° latitude for Black Sea, Mediterranean Sea, Northwest Shelf and Southwest Shelf seas. The grid cell for the Baltic sea is 1° longitude per 1° latitude. For each sampled grid cell, the maximum fraction of the water column sampled by the observation profiles located in that grid cell is calculated. The parameter is estimated as the monthly mean water column fraction sampled for all In Situ TAC regions.

The horizontal and vertical coverage calculations are performed independently but similarly for the TEMP and PSAL variables.

For additional information regarding the in-depth validation of this product, the calculation of the assessment metrics presented in this product other detailed information in quality and noticeable events please refer to the reference quid document CMEMS-INS-QUID-013_001.

Important notice:
The contents of this document are an assessment based on the best set of observations available for evaluation at the time the operational system was validated. The validation methodology was defined and agreed within CMEMS, inheriting the long experience of MyOcean and MERSEA series of projects (Hernandez et al., 2018) The results presented in this report and derived estimated accuracy numbers (EAN) are representative of average error levels over large areas of the ocean. These numbers might be used as a mean error in one given point of the area, but in order to refine error estimates locally, the reader is invited to use complementary information from reference QUIDs (error maps for instance, when available).

1. Variable TEMP

a. Horizontal coverage

The CORA dataset horizontal coverage strongly depends on the sensor technology and the sensor networks deployments. Table 1.1 and Figure 1.2 shows the statistics and the time series for temperature horizontal coverage in the In Situ TAC regions. For all regions, the horizontal coverage is rather low in the first period (1950-1969). During the 1970-2004 period, the horizontal coverage strongly increases thanks to the deployment of numerous XBT instruments. Last, the horizontal coverage keeps increasing during the 2005-2022 period, especially in the deep ocean zones, thanks to the deployment of the Argo network. The step in the ocean coverage during the Argo era is however lower in the In Situ TAC regions covered by large continental shelves (Northwest shelf, Southwest shelf, Baltic sea, Mediterranean sea) since Argo floats cannot be deployed on continental shelves. The Arctic zone coverage have the same behaviour since the Argo floats are not deployed in the ice-covered zones. The values remain however low in the Arctic zone due to the difficulty to perform temperature profiles under the ice coverage.

TEMP	Horizontal Coverage					
	1950-1969		1970-2004		2005-2022	
	Mean	Std	Mean	Std	Mean	Std
Global	48.7	12.2	70.7	5.7	84.2	4.6
Arctic	13.7	6.9	14.0	6.2	16.2	14.8
Baltic	28.7	12.8	57.0	12.7	61.6	7.2
BlackSea	17.5	13.9	31.3	18.2	20.3	5.7
Med Sea	25.1	9.6	34.2	11.0	23.9	6.4
NWS	23.8	8.7	34.0	8.5	40.5	5.5
SWS	16.7	6.2	28.4	5.1	31.2	2.9

Table 1.1: Estimated ocean horizontal mean coverage for temperature profiles. NWS stands for Northwest shelf region and SWS stands for Southwest shelf region.

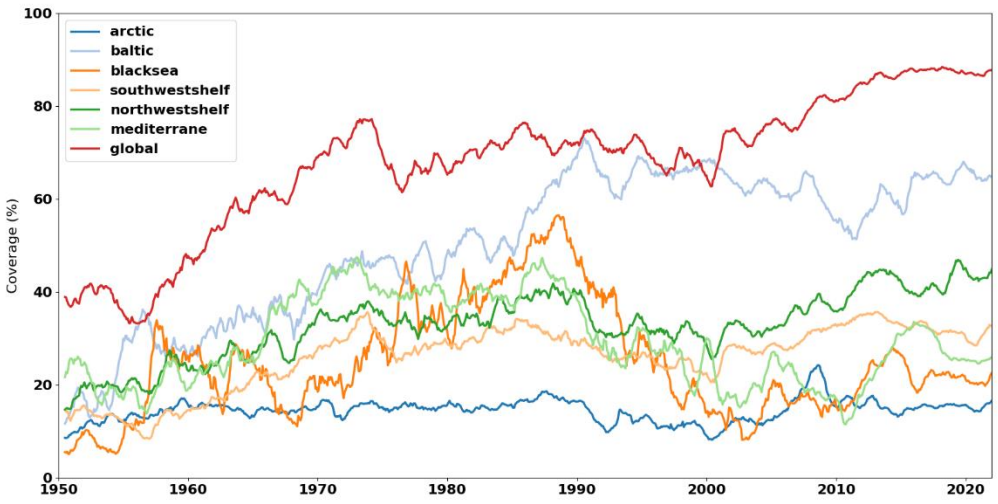

Figure 1.2: TEMP horizontal coverage time series.

b. Vertical coverage

The ocean data mean vertical coverage of the CORA dataset depends on the technology of the ocean sensor and the deployment of international ocean measurement networks (Argo, TAO/TRITON/RAMA/PIRATA, WOCE campaigns, etc…). For the 1950-1969 period, most of the deployed instruments are MBT of bottle like sensor, with a low vertical coverage capacity due to the limited number of vertical sampling of bottle devices. The vertical coverage rises during the 1970-2004 period thanks to the development of the XBT sensor able to efficiently sample the ocean temperature above a continental shelf. These sensors maximum depth is however on the order 1000m depth. A large part of the profiles distributed during this period are thus unable to reach the deep-water masses level. Those water masses are sampled by CTD transects during this period. The 2005-2022 period corresponds to the deployment of the Argo network, with an increasing vertical sampling capacity due to the increasing deployment of deep Argo floats. Figure 2.2 shows the TEMP vertical coverage time series.

The In Situ TAC Baltic sea region vertical coverage remains high during the 3 periods thanks to the low water depth of the Baltic sea.

TEMP	Vertical Coverage					
	1950-1969		1970-2004		2005-2022	
	Mean	Std	Mean	Std	Mean	Std
Global	29.6	5.8	45.8	6.1	69.3	5.3
Arctic	8.3	5.2	10.5	5.6	11.6	3.2
Baltic	53.9	19.7	82.5	9.4	66.5	17.6
BlackSea	22.9	15.0	42.9	19.0	49.8	14.8
Med Sea	24.4	8.9	41.8	8.6	56.1	13.9
NWS	24.3	8.3	38.4	8.5	54.7	6.5
SWS	15.0	5.5	31.2	5.8	53.2	5.2

Table 2.1: Estimated ocean vertical mean coverage for temperature profiles. NWS stands for Northwest shelf region and SWS stands for Southwest shelf region.

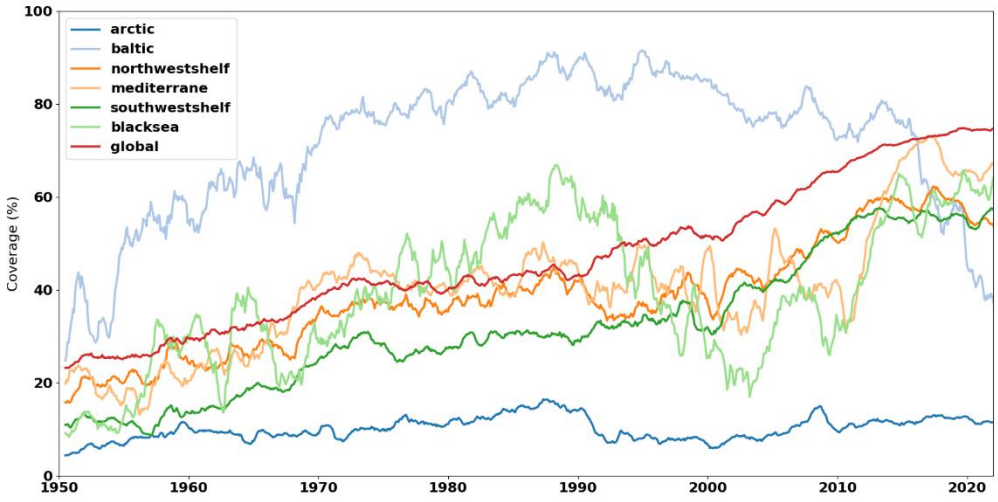

Figure 2.2: TEMP vertical coverage time series.

2. Variable PSAL

c. Horizontal coverage

The salinity horizontal coverage is increasing during the 3 time periods. The values are however lower than the temperature horizontal coverage values and the increase during the 2nd period is weaker, as shown on table 3.1. This is a consequence of the difficulty of measuring ocean salinity and the deployment of numerous instruments measuring temperature only (XBTs for instance). However, the contribution of the numerous new bottles measurements for the historical period can be observed. The Salinity horizontal coverage is however closer to the temperature horizontal coverage during the 2005-2022 period thanks to the deployment of the Argo network and the democratization of CDT sensors. Figure 2.2 shows the PSAL horizontal coverage time series.

PSAL	Horizontal Coverage					
	1950-1969		1970-2004		2005-2022	
	Mean	Std	Mean	Std	Mean	Std
Global	19.2	7.9	31.9	11.5	80.4	7.9
Arctic	11.7	6.3	11.65	5.5	15.8	4.7
Baltic	26.6	11.65	52.78	13.1	52.0	8.4
BlackSea	13.8	12.9	26.8	17.27	18.9	5.4
Med Sea	5.2	4.6	10.3	6.6	21.2	7.7
NWS	15.8	6.2	23.9	6.9	36.1	5.3
SWS	5.0	2.4	10.8	4.2	28.2	3.9

Table 3.1: Estimated ocean horizontal mean coverage for salinity profiles. NWS stands for Northwest shelf region and SWS stands for Southwest shelf region.

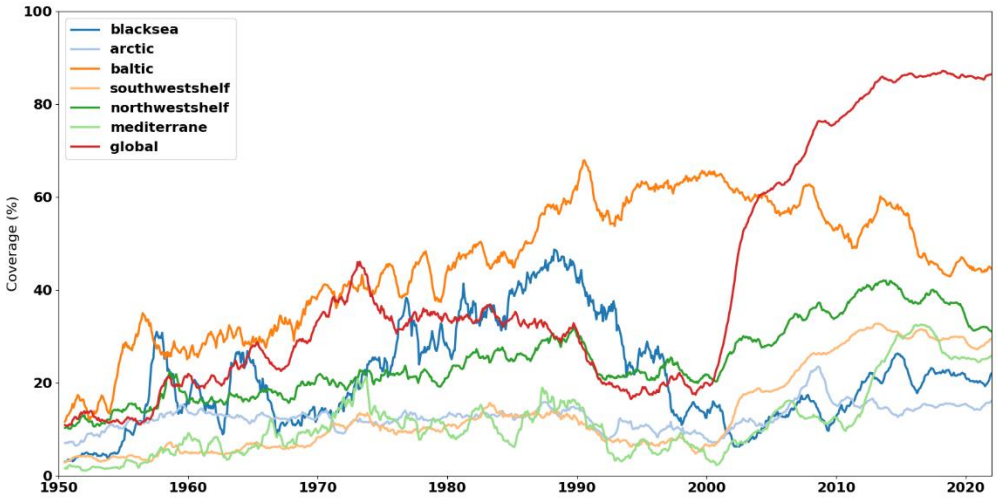

Figure 3.2: PSAL horizontal coverage time series

d. Vertical coverage

The salinity mean vertical sampling is often higher than the corresponding temperature mean vertical sampling since most of the instruments able to measure salinity are also able to reach the sea floor in the deep ocean zones. The mean coverage is consequently not decreased by the use of subsurface instruments (such as XBTs and MBTs for the temperature vertical subsampling case). As a consequence, the relative high mean vertical sampling rates of the salinity measurements have to be contrasted with the lower salinity surface coverage. See Table 4.1 for statistics and figure 4.2 for the full time series.

PSAL	Vertical Coverage					
	1950-1969		1970-2004		2005-2022	
	Mean	Std	Mean	Std	Mean	Std
Global	20.3	6.4	35.5	8.3	69.5	5.4
Arctic	6.9	4.6	8.3	4.5	11.2	3.1
Baltic	49.9	19.0	76.9	11.3	65.6	17.5
BlackSea	19.3	14.9	38.7	18.9	48.7	15.3
Med Sea	9.1	8.1	17.6	11.1	51.8	17.7
NWS	18.3	6.5	29.1	8.4	52.6	6.4
SWS	7.9	3.3	16.9	6.8	50.2	6.5

Table 3.1: Estimated ocean mean vertical coverage for salinity profiles. NWS stands for Northwest shelf region and SWS stands for Southwest shelf region

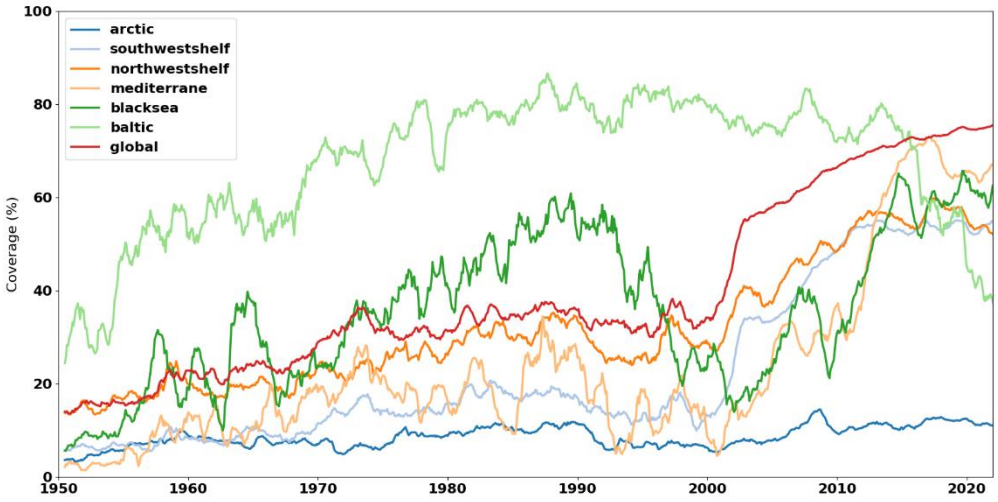

Figure 3.1: PSAL vertical coverage time series.

References

Hernandez, F., et al., 2018: Measuring performances, skill and accuracy in operational oceanography: New challenges and approaches. In "New Frontiers in Operational Oceanography", E. Chassignet, A. Pascual, J. Tintoré, and J. Verron, Eds. GODAE OceanView, 759-796, doi:10.17125/gov2018.ch29.