

CORA (CORiolis Re-Analyses) : IN-SITU RE-QUALIFIED DATASET AT THE CORIOLIS DATA CENTER

IMDIS 2013, Venice, Lucca September 2013



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1. Introduction

At Ifremer data center, a program named **Coriolis** has been set up at the beginning of the 2000's in the wake of the development of operational oceanography in France. The project was launched in order to contribute to the ocean in situ measurements part of the French operational system (e.g. Mercator group). It has been especially involved in developing continuous, automatic, and permanent observation networks. The data center is **collecting ocean data in real time, doing expertise on them with its own quality procedures.**

One major goal is also to distribute an extraction of this comprehensive set of ocean in-situ data, and qualified not only for operational but also for research purposes. This is also a way to improve the quality of this "living" real time database. The CORA dataset (Coriolis Oceanographic data for Re-Analysis) is an extraction of all those temperature and salinity measurements available in the Coriolis database. The Coriolis data center and the R&D team work together to produce a CORA database, the last version (v3.4) covered the period 1990-2011, with the objective to provide an update each year (version 4 in progress).

First a description of the CORA dataset is presented as well as the quality controls done on this dataset, then some examples of the main uses of this dataset are given.

2. Description of the Dataset

The CORA dataset basically contains global, sub-surface **ocean profiles of in-situ temperature and salinity at observed levels.** From those raw data, available profiles data are available at standardized levels, as well as **gridded fields of T/S obtained through objective analyses.**

DATA TYPE : The Coriolis center collects data from argo program, French research ships, GTS data, GTSP, GOSUD, MEDS, voluntary observing and merchants ships, moorings, and World Ocean Database (not in real time for the last one). CORA contains data from different types of instruments : argo floats, XBT, CTD and XCTD, and Mooring Data (see figure 1). We also show a set of unknown type of stations, because data from GTS is not always associated with information about the type of instrument used for the measurement. Figure 2 shows the temporal distribution of the data and figure 3 the strong contribution of the Argo program.

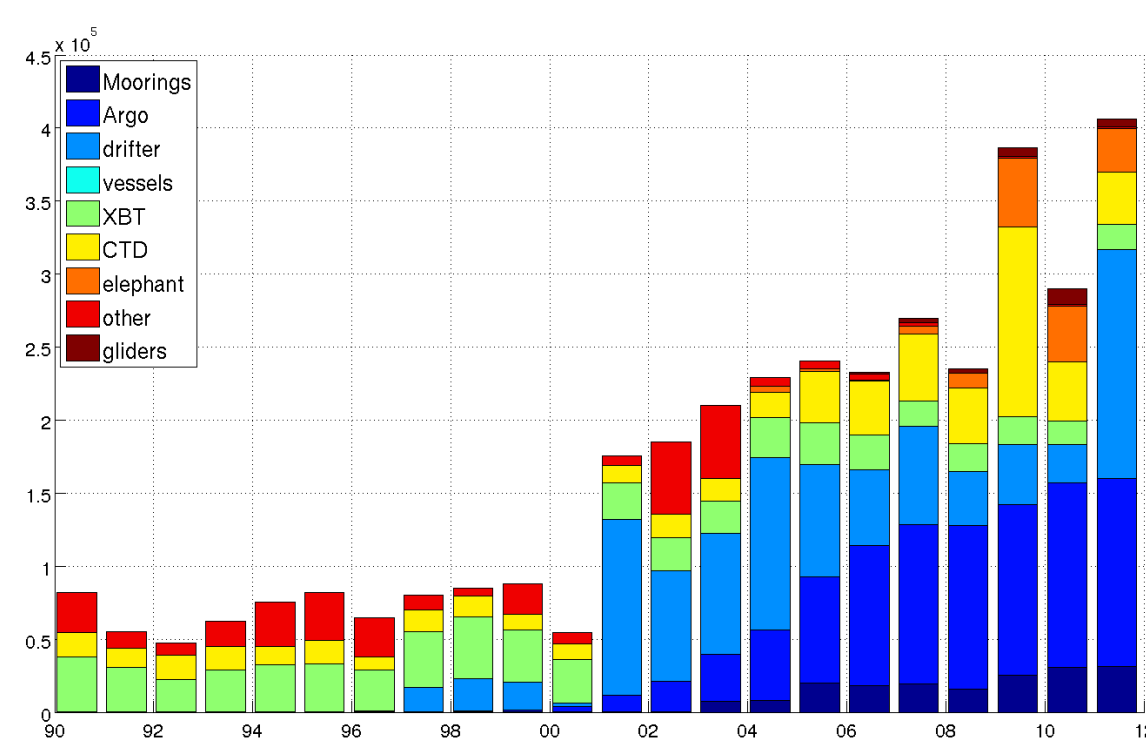


Fig. 2: Time series histogram of CORA stations number from 1990 to 2012.

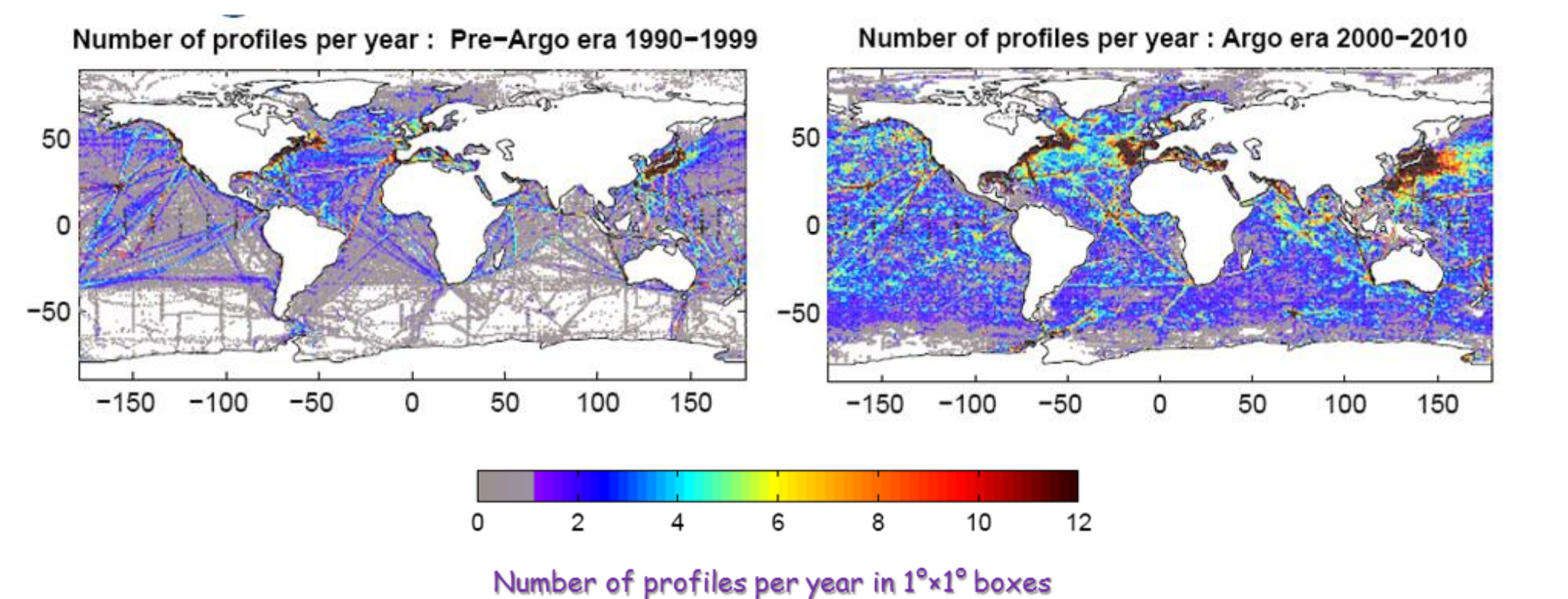


Fig. 3: Strong contribution of the Argo program.

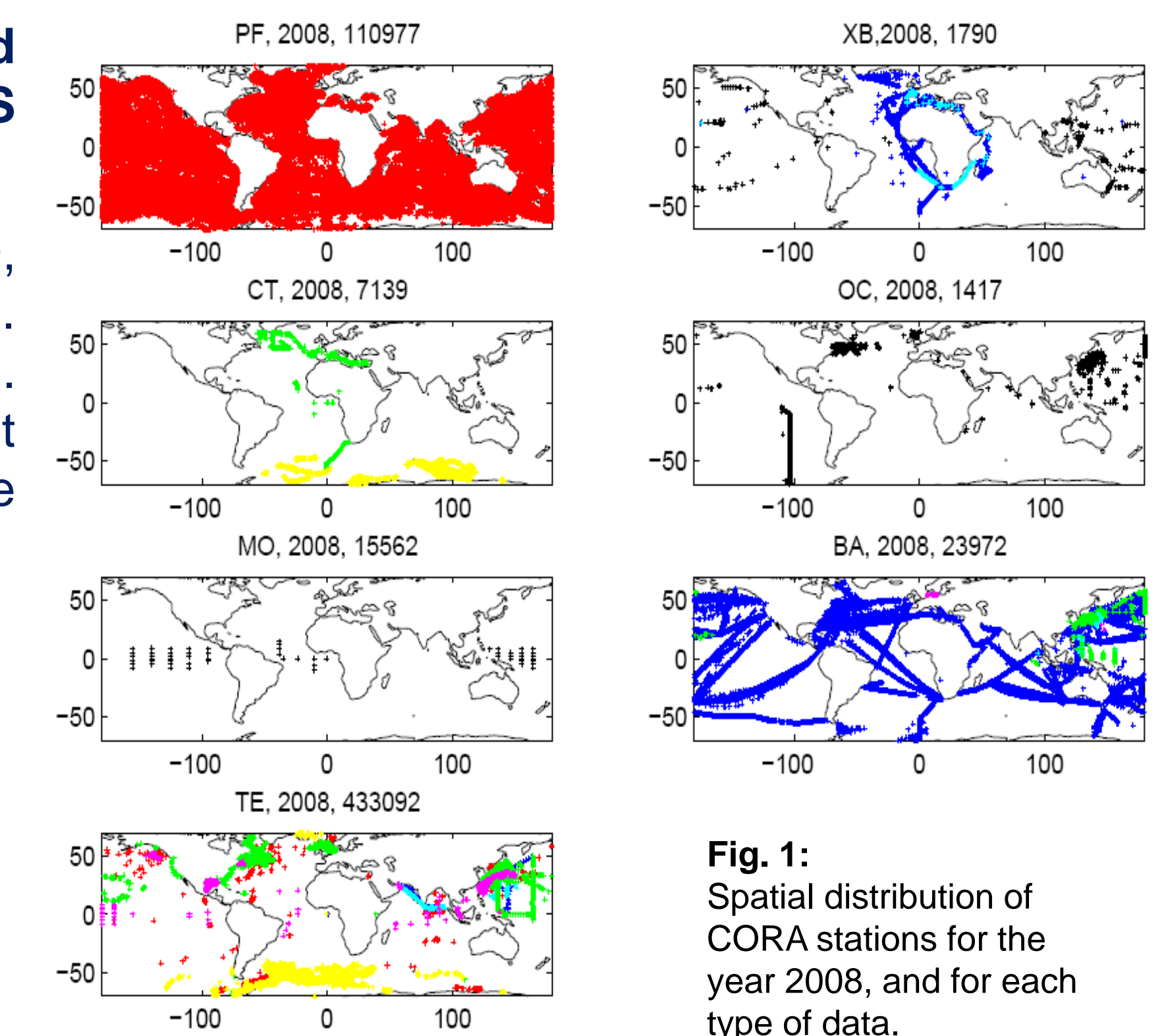


Fig. 1: Spatial distribution of CORA stations for the year 2008, and for each type of data.

QUALITY CONTROLS : In addition to the real time quality checks, several other controls were performed on the whole dataset 1990-2011 (figure 4) :

- **Statistical tests** based on objective analysis are performed during the extraction process. These statistical tests produce alerts on doubtful profiles that are visually checked.
- **Systematic tests** : negative pressure, acceptable range of T, S values in function of depth and region, T or S equal to zero, constant values along depth, comparison to climatology ($>20\sigma$), large salinity gradient at the surface, systematic bias. Again, doubtful profiles are visually checked after.
- **Tests against climatology** : profiles out of the 5σ climatological range were visually checked. Moreover, when the alert was from an Argo platform, the float was controlled over all its life period (figure 5). Additionally, it was checked that the recent Argo grey list was applied.
- **Duplicate check**

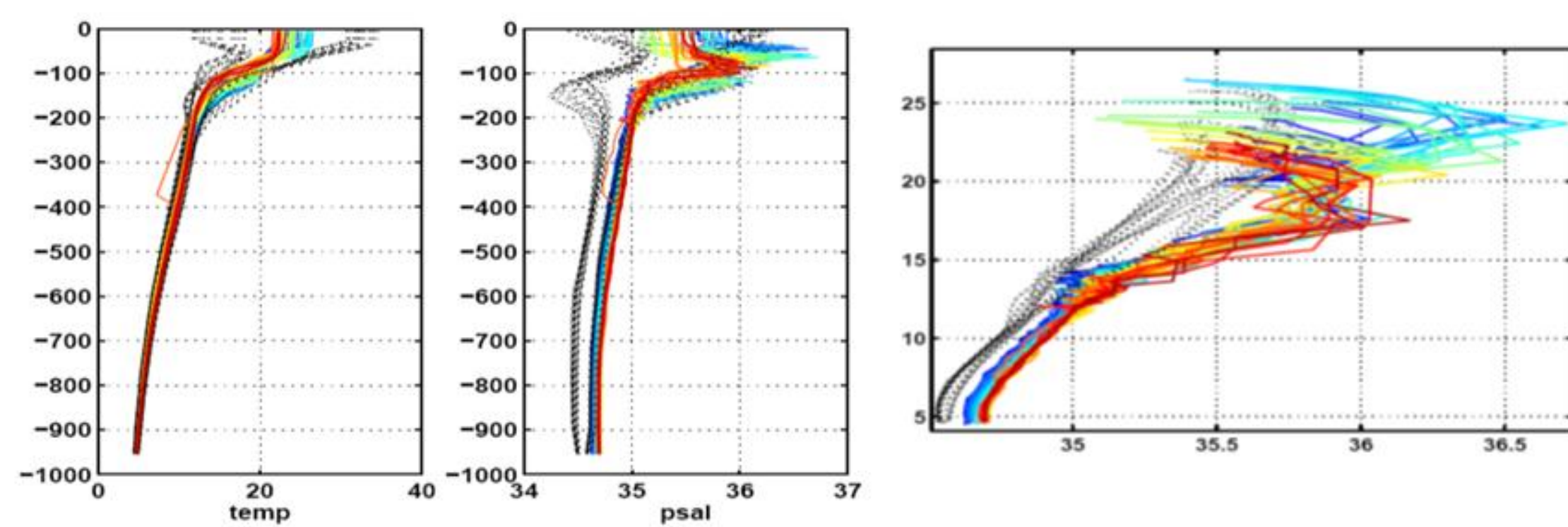


Fig. 5: Time series from an Argo platform (3900062)

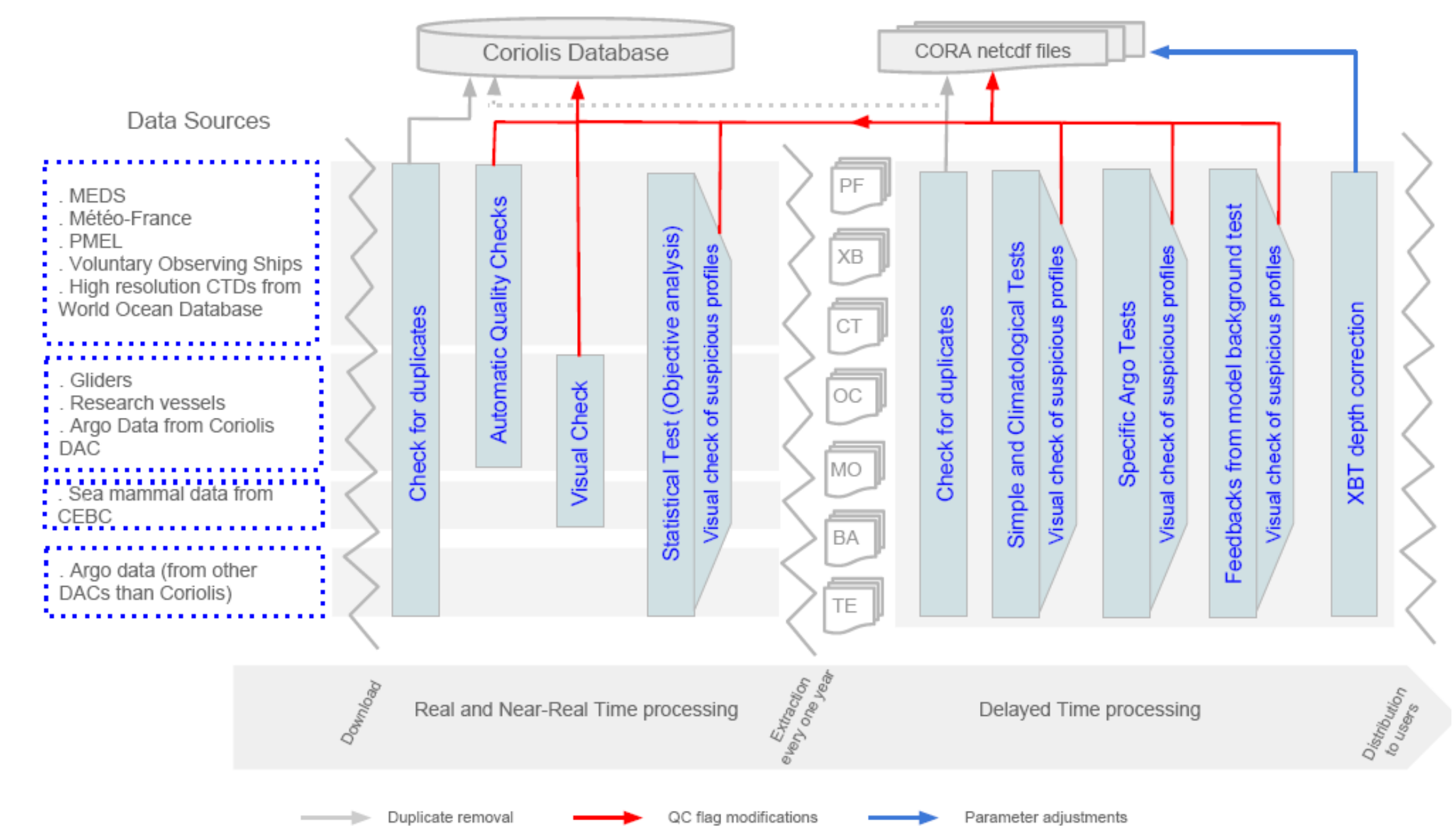


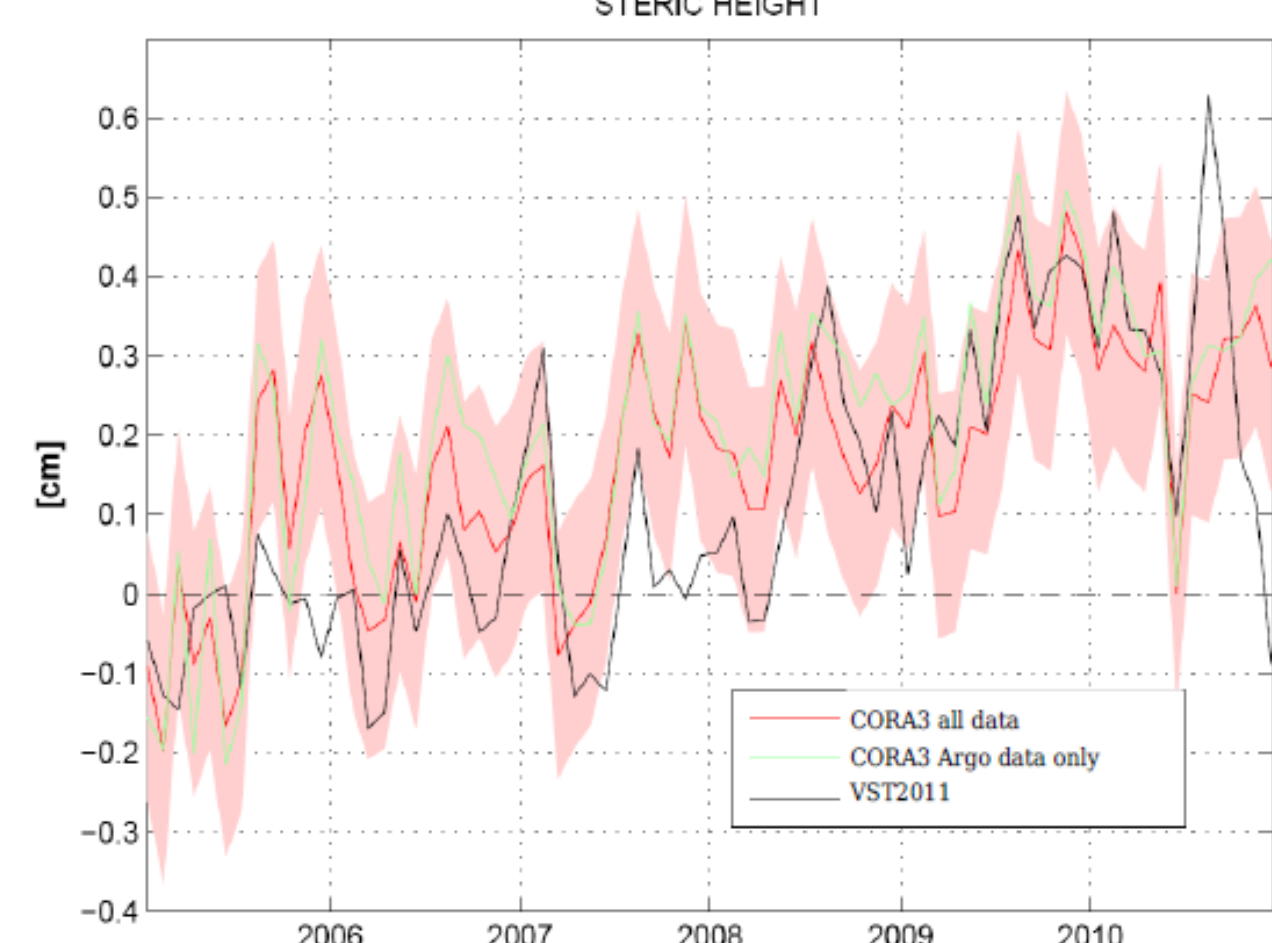
Fig. 4: Steps of the quality control

3. Results and uses of the dataset

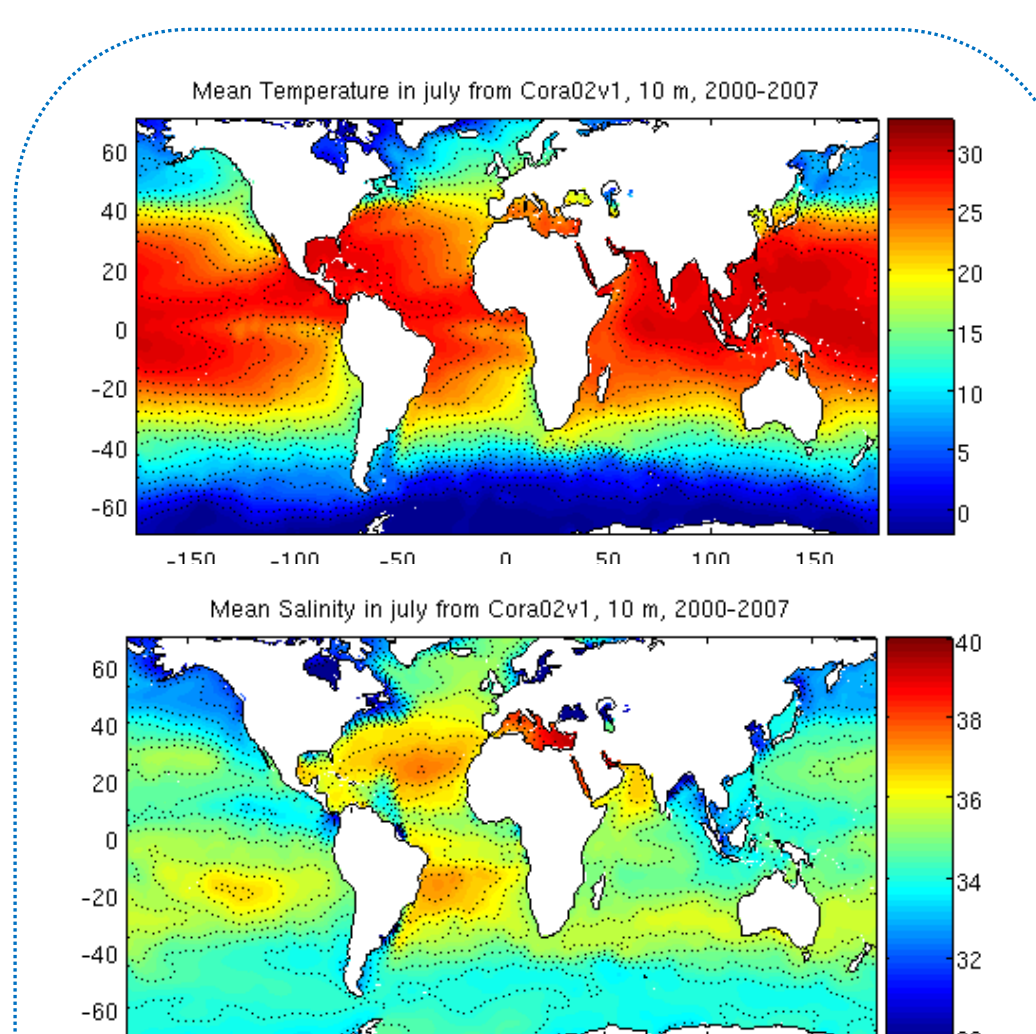
CORA database is meant to investigate specific scientific questions. Diagnostic tools have been developed (including global ocean indicators) and give information on the quality of the dataset and its potential applications. Dataset is used to estimate the change in global ocean temperature and heat content, assimilation in models, validation of ocean models. It is also a way to monitor ocean variability as it is done in the frame of MyOcean European project. A cooperation with MyOcean In-situ TAC and SeaDataNet improves the dataflow between centers as well as the quality of the dataset.

Estimation of GSSL for the year 2005–2010 with a 1500m reference depth.

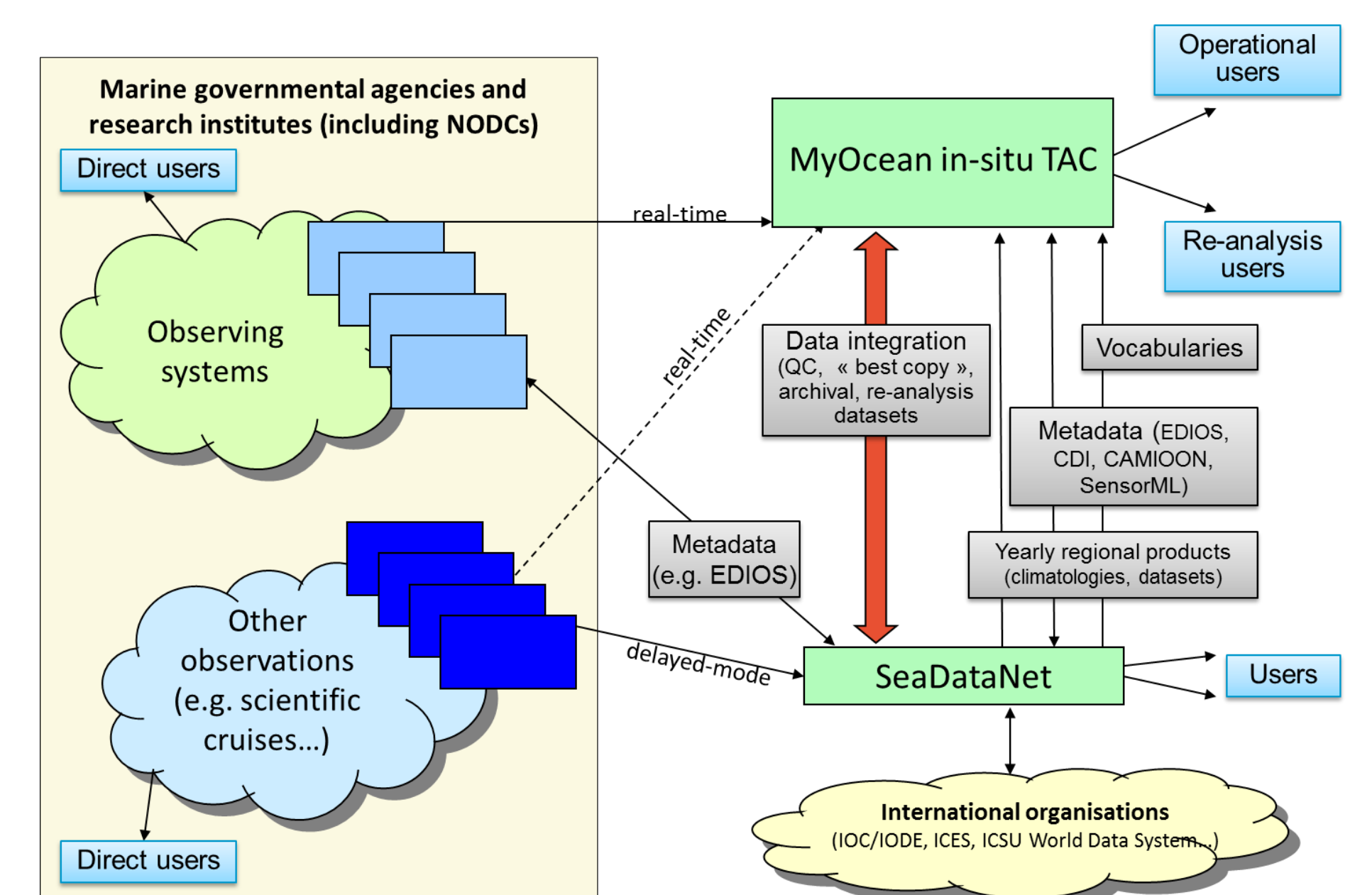
The calculation is based on a simple box averaging method described in von Schuckmann and Le Traon (2011) (VST2011). Results obtained with CORA3 (red and green curves) are compared to those obtained by VST2011. The 6-yr trends obtained are $0.64 \pm 0.12 \text{ mmyr}^{-1}$ with CORA3 ($0.58 \pm 0.10 \text{ mmyr}^{-1}$ for CORA3 with only Argo data) and $0.69 \pm 0.14 \text{ mmyr}^{-1}$ for VST2011. Error bars (red areas) are shown for CORA3 (all data) and are calculated as described in VST2011. This total error includes the uncertainties on the averaged parameter in every $5 \times 10 \times 3$ -month box and the choice of the reference climatology, but it does not take into account possible unknown systematic measurement errors.



Global ocean indicators – GSSL estimation (Global Steric Sea Level) (Cabanes et al., 2013)



July climatology of T and S at 10m obtained from the gridded fields



Link with MyOcean and SeaDataNet

CORA dataset (version 3.4) is available for download, See CORIOLIS website (<http://www.coriolis.eu.org/Science/Data-and-Products/CORA2>).