SeaDataNet regional climatologies: an overview

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1 Objectives

In the frame of the SeaDataNet project, a set of regional climatologies for temperature and salinity has been developed the different regional groups. The data used for these climatologies are distributed by the 40 SeaDataNet data centers. These climatologies have several uses:

1. The detection of outliers by comparison of the in situ data with the climatological fields;
2. The the optimization of locations of new observations;
3. The initialization of numerical hydrodynamic model;
4. The definition of a reference state to identify anomalies and to detect long-term climatic trends.

Some results are presented in this poster.

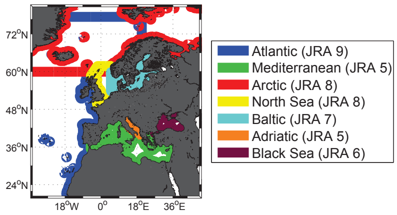

FIGURE 1: *Areas covered by the regional climatologies. The Atlantic region extend to America coast, but only the part close to Europe is showed here. Adriatic climatology is an additional product of JRA 5, created in collaboration with OGS (Trieste).*

2 Method and covered regions

The climatologies treated in this work are:

- JRA 5: Mediterranean Sea (+ Adriatic Sea),
- JRA 6: Black Sea,
- JRA 7: Baltic Sea,
- JRA 8: North Sea and Arctic Sea.
- JRA 9: Atlantic Ocean.

Diva (Data Interpolating Variational Analysis, Brasseur et al., 1996; Troupin et al., 2010) software is implemented and tailored for each regional center. The method consists in finding a field φ that minimizes a variational principle that takes into account: **1.** the misfit between the data and φ and **2.** the regularity of the reconstructed field. An advanced finite-element method (Fig. 2) provides high numerical efficiency and automatic consideration of boundary effects.
The geometrical characteristics (coastlines, bathymetry) and the distribution of data (correlation length, signal-to-noise ratio, reference field) are taken into account for the adaptation of the regional configurations (Tab. 1).

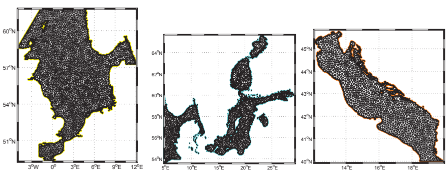

FIGURE 2: *Examples of contours and finite-element meshes use to perform the data analysis.*

TABLE 1: *Configurations of Diva for the different regions. L is the correlation length and λ the signal-to-noise ration. Fit denotes a fit of the data correlation function with an analytical form; GCV stands for General Cross Validation method for the estimation of λ*

Region	Data sources	Parameter optimization L	λ	Time period
JRA5	regional + MEDAR	fit	fixed	1975-2005
JRA6		in progress		
JRA7	regional + ICES	fit	GCV	1975-2005
JRA8 – Arctic Sea	regional	fit	GCV	1970-2008
– North Sea	WOD05 + ICES	fit	GCV	1975-2005
JRA9	Coriolis + regional	fixed	fixed	1975-2005

3 Results

Some results extracted from Diva-4D NetCDF fields produced by the different JRA partners are presented here. The complete climatologies can be viewed through a web interface (Barth et al., 2010): http://gher-diva.phys.ulg.ac.be/web-vis/clim.html and are available for direct download at http://gher-diva.phys.ulg.ac.be/data/SeaDataNet-domains/.

Arctic Sea salinity: the salinity at 100 m is showed for the month of February (Fig. 3). The influence of freshwater fluxes near the north coast of Norway and off the east coast of Svalbard Island.

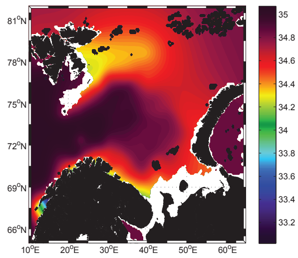

FIGURE 3: *Salinity field in the Arctic Sea in February at 100 m.*

Atlantic Ocean salinity: Fig. 4 displays the salinity field for the month of October, extracted at a 1400 m depth. There the influence of high-salinity water is clearly identified west of Gibraltar Strait.

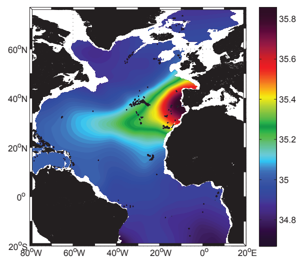

FIGURE 4: *Salinity field in the Atlantic in October at 1400 m.*

Mediterranean Sea temperature: the January temperature field at 850 m (Fig. 5) again illustrates the contrast between water mass characteristics, this time between Atlantic and Mediterranean waters, the latter being characterized by higher temperatures and salinity. Also, a difference between western and eastern Mediterranean seems visible, though it can be to a data coverage issue.

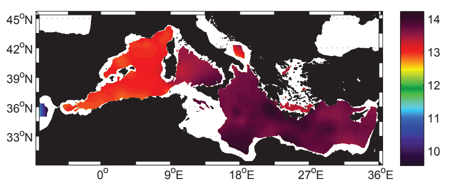

FIGURE 5: *Temperature field in the Mediterranean Sea in January at 850 m*

North Sea salinity: the salinity at 30 m is compared with the World Ocean Climatology 2005 (Locarnini et al., 2006) for the month of February (Fig. 6). The Diva analysis is able to provide a better resolution in the coastal zone, especially close to Norway.

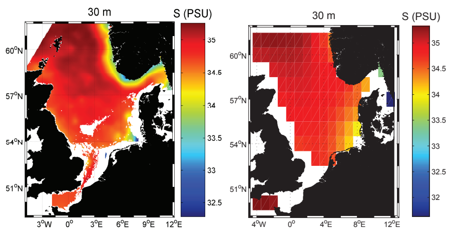

FIGURE 6: *Salinity computed by Diva (left) and extracted from the World Ocean Atlas 2005 at 30 m in February.*

Baltic Sea temperature: Fig. 7 shows the temperature in March at 40 m. It is instructive to note the separation of water mass properties due to their physical separation by the boundaries: at the east, warmer water coming from the North Sea is visible, while cool waters are present in the northern part of the domain.

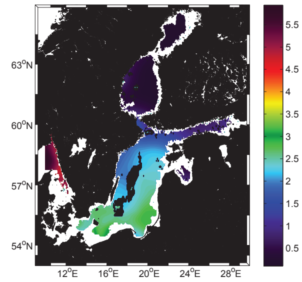

FIGURE 7: *Temperature field in the Baltic Sea, computed at 400 m in March.*

Mediterranean Sea SST: data are extracted from AVHRR sensor. In this example, L is determined a fit of the data correlation with a theoretical function, while λ is assigned the value 10. The objective is the comparison of Diva method with Optimal Interpolation (OI) applied on satellite data.

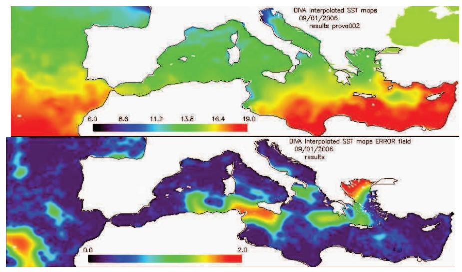

FIGURE 8: *Temperature field and corresponding error field computed on January 9^{th}, 2006.*

4 Conclusions

During the last four years, a solid work has been carried out in order to prepare data sets and generate gridded climatology from them. The product quality was progressively improved, thanks to the special effort made in data collection and in the enhancements in the analysis process. The next steps will consist in a better control of both the data and the analysis in order to make these regional climatologies directly usable for model initialization.

Acknowledgments

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