Comparison between Optimal Interpolation (OI) and Data-Interpolating Variational Analysis (Diva) for the generation of analysis and error gridded fields

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ABSTRACT

Optimal Interpolation (OI) is one of the most popular method. It is based on the minimization of the expected error variance.

The assets: the ease of use and the error field generated along with the analysis.

The drawbacks: the numerical cost and the quality of the results when the number of data is not sufficient or when the covariances are not correctly specified.

Data Interpolating Variational Analysis (Diva) is an alternative to OI. It is based on the minimization of a cost function measuring the data-analysis mismatch and the regularity of the reconstructed field, through a finite-element solver.

The assets: it allows the consideration of anisotropies and decorrelations introduced by coastlines or frontal structures.

The drawbacks: the apparent complexity of the method.

In this work we compare the analysis and error fields provided by the two methods.

DATA

We work with salinity measurements in the Mediterranean Sea at a depth of 30 m in July, for the 1980-1990 period.

ANALYSIS

Once the analysis parameters are set, the gridded field is obtained. We observe the characteristic zonal gradient of salinity, with the lowest values in the Alboran Sea.

ERROR FIELDS

The error field is computed with different methods and provides fields similar to that of OI, except for the poor man’s estimate, which underestimates the error. As expected, we obtain high errors in regions void of data (see Figure 1). The advantage of the poor man’s estimate is its low computational cost. With more numerical operations, the other methods provide a more consistent error field.

The novelty is the estimation of the real covariance, which is never parameterized explicitly in Diva. It is estimated using two simultaneous Diva executions.

REFERENCES

The complete list of papers can be found at http://modb.oce.ulg.ac.be/mediawiki/index.php/Diva_publications

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HOW TO GET THE CODES

The code is distributed under the terms of the GNU General Public License (GPL). It is available at http://modb.oce.ulg.ac.be/mediawiki/index.php/Diva#How_to_get_the_code or by scanning the QR code.

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