



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

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The generation of gridded fields from non-uniformly distributed observations (both in space and time) is a frequent concern in geosciences. The range of applications is wide, going from model initializations to validation exercises or simple plotting purposes.

Many gridding methods were developed and used in ocean sciences. One of the most popular is the Optimal Interpolation (OI), which is based on the minimisation of the expected error variance. The assets of the method are the ease of use and the error field generated along with the analysis. Its drawbacks are 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.

The Diva (Data Interpolating Variational Analysis) method is another gridding technique, based on the minimisation of a cost function measuring the data-analysis misfit and the regularity of the reconstructed field. The minimisation is performed with a finite-element solver and for particular forms of the covariance functions, allowing the consideration of anisotropies and decorrelation introduced by coastlines or frontal structures. Various way to compute the error field are also implemented.

Under some circumstances, OI and Diva methods are equivalent. This is demonstrated with a two-dimension application using salinity measurements in the Mediterranean Sea. OI and Diva provide similar gridded fields (correlation: 98.6%, RMS of the difference: 0.02). The error fields provided by the different methods show that Diva error field that used the the real covariance function produces an error field similar to the one of OI, except in the coastal areas.