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Three-dimensional analysis of oceanographic data with the software DIVA

C. Troupin (1), M. Ouberdous (1), M. Rixen (2), D. Sirjacobs (1) and J.-M. Beckers (1)

(1) GeoHydrodynamics and Environmental Research, University of Liège, (2) NURC - NATO Undersea Research Centre, Viale San Bartolomeo 400, 19138 La Spezia, Italy (ctroupin@student.ulg.ac.be)

In oceanography, the process of gridding data is frequently used for various purposes, *e.g.* initialization of hydrodynamic models, or graphical representation of sparse data.

DIVA (Data-Interpolating Variational Analysis) is designed to perform such gridding tasks. It has the advantage of taking into account the intrinsic nature of oceanographic data, *i.e.* uncertainty in *in situ* measurements and anisotropy due to advection and irregular coastlines and topography.

Three-dimensional reconstruction of temperature and salinity fields is achieved by stacking horizontal layers where independent analysis with DIVA are performed. Nevertheless, analysis in regions void of data may result in the presence of static instabilities between two or more consecutive layers.

The method implemented in DIVA to remove such kinds of instabilities is the object of the present work. It consists of adding pseudo-data from one layer to the upper adjacent layer in order to create stable stratification in the vicinity of instabilities.

Two approaches for assigning values to the pseudo data are tested: the first is called the *mixing approach* and aims at simulating a mixing process between two layers; the second is called the *minimal perturbation*, as it strives to minimise the perturbations inthe pseudo-data.

A realistic application using temperature and salinity profiles in the North Atlantic is

carried out and the results are compared with World Ocean Atlas climatologies.