

## INGV-CMCC Ocean Analysis disclaimer

The stream2 Ocean Analysis were produced using the INGV-CMCC Global Ocean Data Assimilation System, an OPA8.2 [Madec et al., 1999] ocean circulation model combined with the System for Ocean Forecasting and Analysis scheme (SOFA) [De Mey and Benkiran, 2002], which is a Reduced Order Optimal Interpolation scheme.

The model has a  $2^\circ \times 2^\circ \cos\phi$  horizontal resolution, except for the  $20^\circ\text{N}$ – $20^\circ\text{S}$  latitude belt, where the meridional grid spacing is progressively decreased to  $0.5^\circ$  to better resolve the equatorial dynamics.

The integrations are forced using ERA40 fields of momentum, heat and corrected freshwater fluxes [Troccoli and Källberg, 2004].

From September 2002 onwards, ECMWF operational surface fluxes are used.

Sea surface temperature is strongly restored to observed SST, with a relaxation coefficient of  $200\text{W/m}^2$ .

A full-depth relaxation to Levitus temperature and salinity climatology is applied poleward of  $60^\circ\text{N}/60^\circ\text{S}$ , with a gradual reduction of the restoring time scale from 3 yr to 50 days occurring in the  $60^\circ$ – $70^\circ\text{N}$  (S) latitude belt. The restoring time scale is 50 days at the top level, gradually increasing to 1 yr at the bottom.

Quality-controlled temperature and salinity profiles from the EN3 oceanographic database [Ingleby and Huddleston, 2007] are assimilated every 7 days, from January 1958 to December 2006.

During the entire length of the runs, a daily adjustment is applied to the model sea surface height aimed to remove a drift associated with the nonzero residual of the globally averaged freshwater fluxes.

Ensemble member 0 is the unperturbed run. Ensemble member 1 and 2 were produced using perturbed wind stresses (positively perturbed for member 1 and negatively perturbed for member 2).

### Note 1

Due to a system failure, the 1987 SST forcing file revealed to be corrupted in the last few months, introducing a short lived, but marked perturbation that extended somewhat in the first few months of 1988. After inspection, it was considered safe, for the hindcast production, to replace these two years with corrected ones, maintaining the rest.

The data are stored as Ocean Analysis 1 (or Set 1).

### Note 2

Being a small and decreasing perturbation still retained in the deep layers from 1989 onwards, it was decided, for model inter-comparison purpose, to produce a corrected unperturbed run from 1989 onwards.

Data are stored as a separate set, called Ocean Analysis 2 (or Set 2).

### References:

A. Bellucci, S. Masina, P. Di Pietro, and A. Navarra, "Using temperature-salinity relations in a global ocean implementation of a multivariate data assimilation scheme.", *Monthly Weather Review*, November 2007, vol 135, pp. 3785-3807

De Mey, P., and M. Benkiran, 2002: A multivariate reduced-order optimal interpolation method and its application to the Mediterranean basin-scale circulation. *Ocean Forecasting: Conceptual Basis and Applications*, N. Pinardi and J. D. Woods, Eds., Springer Verlag, 281–306.

Ingleby, B., and M. Huddleston, 2007: Quality control of ocean temperature and salinity profiles - historical and real-time data. *Journal of Marine Systems*, 65, 158-175

Madec, G., Delecluse, P., Imbard, I. and Levy, C., (1999), OPA 8.1 Ocean General Circulation Model reference manual, Note du Pôle de modélisation,, Inst. Pierre-Simon Laplace (IPSL), France, No. 11, 91 pp.

Troccoli, A., and P. Kallberg, 2004: Precipitation correction in the ERA-40 reanalysis. ERA-40 Project Rep. Series 13, 6 pp.