

Assessing the Robustness of Climate Signals in the New ECMWF Ocean Reanalysis System 4 (ORAS4)

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The new ORAS4 (Ocean ReAnalysis System 4) is now operational at ECMWF. It consists on 5 ensemble members spanning the period 1958 to present. The ocean reanalysis has been produced by assimilating subsurface profiles of temperature and salinity, sea surface temperature and altimeter sea level using NEMOVAR (a variational data assimilation system for the NEMO model), in its 3D-var configuration. The first guess is provided by the NEMO ocean model (at a resolution of approximately 1 degree in the horizontal, with equatorial refinement) forced by surface fluxes from the ERA-40 and ERA-Interim atmospheric reanalysis.

The impact of data assimilation in the ocean re-analysis is evaluated by a series of objective criteria, involving assimilation statistics (fit to data, error growth), correlation with long time-series, and comparison with independent data (currents and RAPID derived transports). A series of Observing System Experiments (OSEs) have been conducted to evaluate both the performance of the assimilation and the impact of observations on relevant climate signals.

Several climate signals have been evaluated. Robustness and uncertainty have been assessed by means of OSEs and additional sensitivity experiments. This paper will present results concerning the following climate signals:

1. Ocean heat uptake
2. Trends in the equatorial thermocline
3. Atlantic Meridional overturning circulation

The ocean reanalysis is continuously updated, lagging real time by less than one month, thus providing a valuable tool for quasi-real time climate monitoring.

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