GLORYS ¼° Global Ocean Reanalysis and Simulations of the Period 1992-Present

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The GLORYS (Global Ocean reanalysis and Simulation) Project is motivated by the need of a realistic description of the ocean state and variability over the recent decades, at the global scale, and at the scale of the ocean basins and regional seas. The French research community (CNRS), the operational ocean forecasting center MERCATOR-Ocean and the CORIOLIS data center, have gathered their skills and expertise in physical oceanography, ocean modeling and data assimilation, to carry out global ocean reanalyses at eddy scale resolution for the period 1993 to present. This reanalysis effort is part of the project MyOcean granted by the European Commission within the GMES Program (7th Framework Program).

This paper will present the GLORYS reanalysis system relies on the ORCA025 global model configuration developed by the DRAKKAR consortium, on the basis of the NEMO3 ocean/sea-ice general circulation model. ORCA025 uses a horizontal grid resolution of 1/4° and 75 vertical levels, which permits the growth of mesoscale eddies. It is used for both operational and climate applications.

The data assimilation scheme is an adaptation of the data assimilation scheme used for operational forecasting by MERCATOR-Ocean. The data assimilation method is based on a reduced order Kalman filter (SEEK formulation) and an incremental analysis update, in conjunction with a bias correction scheme for temperature and salinity. Assimilated data are from the delayed time CORA data base specifically prepared for ocean reanalysis by the CORIOLIS data center, and from AVISO for altimetric data. Sea Surface Temperature, along track Sea Level Anomalies and in situ Temperature and Salinity profile data are assimilated. GLORYS reanalyses are forced with atmospheric surface variables from ERA-INTERIM atmospheric reanalysis, and control simulations with no observation assimilated are systematically produced.

Two reanalyses and one reference simulation with no data assimilation have been produced, validated and are distributed. The first one, GLORYS1, covers the “Argo era” (2002-2008). The second one, GLORYS2, covers the “altimetric era” (1992-2009) and will be updated until 2011. The reference simulation also covers the "altimetric era, and uses the exact same atmospheric forcing as GLORYS2. The paper will present assessments and measures of the quality of GLORYS products obtained from a validation protocol based on recommended GODAE and CLIVAR-GSOP reanalysis diagnostics, and from a comparison with the reference experiment. The scientific value of the GLORYS reanalysis products will be illustrated with results from independent scientific studies obtained in a wide range of areas such as climate, mesoscale processes, mixed layer processes, sea ice, etc.

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