CERA: The ECMWF Coupled Data Assimilation System

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A coupled data assimilation system for reanalysis called CERA (Coupled ECMWF ReAnalysis) is being developed at ECMWF. The CERA project aims at generating a self-consistent ocean-atmosphere state by assimilating both atmospheric and oceanic observations within a coupled model. CERA uses the ECMWF coupled model where the atmospheric component is based on the IFS software and the oceanic component is based on the NEMO framework. While the computation of the nonlinear trajectories needed in the data assimilation uses the coupled model, the computation of the increments is still performed separately for the atmosphere and ocean components and any covariance between them are ignored. This framework is aimed at being flexible enough to adapt to the initialization of medium range, monthly and seasonal forecasting activities.

The building of the CERA system follows several intermediate steps. The first task (called CERA-S) consists in introducing a Sea Surface Temperature (SST) constraint in the coupled model to avoid the model drift while allowing the simulation of coupled processes. The second task, called CERA-A, is based on the existing EMCWF atmospheric data assimilation framework but uses a coupled model in the outer loops. Similarly, the third task, CERA-O, is based on the ocean data assimilation framework used at ECMWF but uses a coupled model in the outer loops. The CERA final product will consist in a merge of the CERA-S, CERA-A and CERA-O systems.

This presentation will describe the concept of the different tasks and the first validation and results obtained from each of them.