



The Met Office Coupled Atmosphere/Land/Ocean/Sea-Ice Data Assimilation System

Daniel Lea, Isabelle Mirouze, Matthew Martin, Adrian Hines, Catherine Guiavarch, and Ann Shelly
Met Office, Ocean Forecasting R&D, Exeter, United Kingdom (daniel.lea@metoffice.gov.uk)

The Met Office has developed a weakly-coupled data assimilation (DA) system using the global coupled model HADGEM3 (Hadley Centre Global Environment Model, version 3). This model combines the atmospheric model UM (Unified Model) at 60 km horizontal resolution on 85 vertical levels, the ocean model NEMO (Nucleus for European Modeling of the Ocean) at 25 km (at the equator) horizontal resolution on 75 vertical levels, and the sea-ice model CICE at the same resolution as NEMO. The atmosphere and the ocean/sea-ice fields are coupled every 1-hour using the OASIS coupler. The coupled model is corrected using two separate 6-hour window data assimilation systems: a 4D-Var for the atmosphere with associated soil moisture content nudging and snow analysis schemes on the one hand, and a 3D-Var FGAT for the ocean and sea-ice on the other hand. The background information in the DA systems comes from a previous 6-hour forecast of the coupled model.

To show the impact of coupled DA, one-month experiments have been carried out, including 1) a full atmosphere/land/ocean/sea-ice coupled DA run, 2) an atmosphere-only run forced by OSTIA SSTs and sea-ice with atmosphere and land DA, and 3) an ocean-only run forced by atmospheric fields from run 2 with ocean and sea-ice DA. In addition, 5-day forecast runs, started twice a day, have been produced from initial conditions generated by either run 1 or a combination of runs 2 and 3. The different results have been compared to each other and, whenever possible, to other references such as the Met Office atmosphere and ocean operational analyses or the OSTIA data. These all show the coupled DA system functioning well. Evidence of imbalances and initialisation shocks has also been looked for.