
Development of Coupled Data Assimilation for the Bureau of Meteorology's Operational Climate Forecast System ACCESS-S

Yonghong Yin^{*†}, Oscar Alves¹, Pavel Sakov¹, Debra Hudson¹, Angus Gray-Weale¹, Mei Zhao¹, and Xiaobing Zhou¹

¹Research Program, Science Innovation Group, Bureau of Meteorology – Melbourne, Australia

Abstract

The Bureau of Meteorology's climate forecast system for weekly to seasonal and longer-range climate outlooks is called the Australian Community Climate Earth-System Simulator – Seasonal (ACCESS-S). The first version ACCESS-S1 operational in August 2018 is based on the UK Met Office GloSea5-GC2 seasonal prediction system, but has enhancements to the ensemble generation strategy to make it appropriate for multi-week forecasting. The ocean and sea ice are initialised using the FOAM (Forecast Ocean Assimilation Model) analyses as per GloSea5. A weakly-coupled data assimilation system for the new version ACCESS-S2 has been developed and implementing in operations. First guess fields are generated from 1-day coupled model integration but cross error covariances between different components are not considered in the data assimilation. Sea surface temperature is strongly relaxed to the daily observations. Ocean in-situ temperature and salinity profiles are assimilated using the ensemble optimal interpolation (EnOI) method with seasonally varying background error covariance estimated from historical intra-seasonal anomalies. The atmospheric component is nudged towards a pre-existing atmospheric analysis and land surface responds to the atmospheric forcing. Results from experiments and their validation for multi-year reanalysis with both assimilated and independent observations will be presented. Comparisons are made with both the previous ACCESS-S1 and a non-assimilating control system. Assessments reveal considerable improvement in the ACCESS-S2 to the subsurface ocean current fields. Further experiment with sea level assimilation that show further improvements to the surface currents will also be presented.

Keywords: coupled data assimilation, ocean data assimilation, ensemble data assimilation, earth system modelling, seasonal prediction

*Speaker

†Corresponding author: yonghong.yin@bom.gov.au