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A Critical Assessment of ECMWF and NCEP Fields for Atmosphere–Ocean De-aliasing

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The Gravity Recovery and Climate Experiment (GRACE) and Follow-On (GRACE-FO) missions require a non-tidal force model for processing the data streams to prevent aliasing of the effects of high frequency atmospheric and oceanic motions into the monthly solutions. The model, known as the AOD (Atmosphere-Ocean De-aliasing) product, is a set of Stokes coefficients that represents the temporal effects of gravitational attraction due to the changing atmosphere-ocean mass distribution. The AOD product contains 3 separate parts – representing contributions from the atmosphere, the ocean, and the total. There have been several versions of the AOD product for GRACE, but the central element has been a reliance on ECMWF weather center products as a standard for the atmosphere and various ocean model outputs with atmospheric forcing.

With the prospect of greater sensitivity for GRACE-FO, the AOD product will require greater temporal resolution and consequently greater temporal resolution will be needed in the atmosphere products used to calculate the atmosphere component and to force the ocean. Furthermore, an improved quick look product is necessary. Currently weather center products required to accomplish this are a mix of operational analysis and forecast products and operational models are subject to changes. This brings with it an inherent inconsistency when used to make the AOD product. In addition, timely access to EMCWF data is limited, but NCEP data products are readily available.

In this presentation, we critically compare ECMWF and NCEP atmospheric fields that are used to calculate the atmospheric component and to force the ocean (near surface temperature and humidity, pressure, radiation, winds, wind stress, and precipitation) and assess the resulting oceanic fields produced by a baroclinic ocean model forced by these fields over a twenty-four-year period including effects on gravity field solutions.

Variations appear globally and suggest where similarities and differences in approach to atmospheric modelling exist. Large variations in specific areas will require a better understanding of the processes occurring there.