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Evaluation of the regional reanalysis COSMO-REA6 vs ERA-Interim for improving the dealiasing analysis of GRACE/GRACE-FO mission data

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This work is part of the Research Group New Refined Observations of Climate Change from Spaceborne Gravity Missions (NEROGRAV), which is funded by the German Research Foundation (DFG). The goal of NEROGRAV is to develop new analysis methods and modeling approaches to improve the resolution, accuracy, and long-term consistency of mass transport series from the GRACE and GRACE-FO missions. This can only be obtained by improving the sensor data, background models, and processing strategies for satellite gravimetry. Within NEROGRAV, the joint Geodesy and Meteorology group at the University of Bonn is responsible for the investigation of the atmospheric and hydrological effects on the dealiasing of GRACE/GRACE-FO observations of the Earth's gravity field.

In the present study we compare 3-hourly data from the ERA-Interim realanysis with a grid size of 50 km based on a hydrostatic model of the atmosphere and the houly data of the non-hydrostatic COSMO reanalysis with a grid size of 6 km (COSMO-REA6, Bollmeyer et.al (2015), QJRMS, *141*(686), 1-15.). To date, atmospheric mass variability has been studied largely through data from hydrostatic models of the atmosphere. Therefore a direct evaluation of the total atmospheric mass variability including non-hydrostatic effects compared to a hydrostatic background model is necessary. Further, GRACE/GRACE-FO is expected to be sensitive to the atmospheric water mass variability. Since a high resolution atmospheric model provides an intensified water cycle, a more localised and enhanced mass variability within all water components is expected in COSMO-REA6.

The objectives of this talk are to (1) present the evaluation results of non-hydrostatic effects and water mass transports on the atmospheric mass variability and (2) assess the scale effects of a coarse vs a fine resolution representation of the atmospheric mass. Both objectives place an emphasis on the contributions of the atmospheric hydrological cycle in two views: the systematic effects are investigated by the mean values, while spatial variability effects are investigated using a principal component analysis. The study concentrates on the summer season 2007 over the CORDEX (North Atlantic, European region) domain.