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Accuracy of recent GRACE and GOCE geoid models from an oceanographic perspective

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Three methods (time-wise, space-wise and direct numerical) were selected by the European GOCE Gravity consortium (EGGc) to compute gravity fields under ESA contract. Each method has its advantages and drawbacks. This presentation shows the oceanographic evaluation of the third gravity field model release by ESA, obtained with GOCE data from November 2009 through April 2011. Results obtained with GRACE models, earlier GOCE models, GRACE+GOCE models, and combined models are also presented.
EGGc already has performed the geodetic validation of the ESA models (spectra, comparison to GPS/leveling data, orbit determination), whereas this evaluation focuses on oceanography.
The different geoid models (GRACE, GOCE, GRACE+GOCE, and combined models) are used, together with an altimetric Mean Sea Surface, to compute the ocean Mean Dynamic Topography and the associated mean geostrophic currents at different spatial resolutions. The mean currents obtained with the various geoid models are compared to the ocean mean geostrophic currents measured by a dataset of SVP buoy velocities available from 1993 to 2010. First, the ageostrophic components (due to Ekman currents, inertial oscillations, tidal currents...) are removed from the drifter velocities as well as the temporal variability as measured by altimetry.
The differences between the mean geostrophic currents derived from gravity field models and the mean velocities inferred from drifter data are then analyzed as a function of resolution (down to 100 km) and location. Such an analysis allows quantifying the gain in accuracy from GRACE to GOCE models compellingly, as well as the gain due to the assimilation of more and more GOCE data into the models. Finally, the filtered mean geostrophic currents derived from gravity field models are compared to unfiltered mean velocities inferred from in-situ data in order to analyse, both globally and regionally, the GOCE geoids omission errors.