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The latest release of ESA's GOCE gravity field model using the direct numerical method

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Three methods (time-wise, space-wise and direct numerical) were selected by the European GOCE Gravity Consortium (EGG-C) to compute gravity fields on behalf of the European Space Agency (ESA). Each of these three methods has its advantages and drawbacks. This presentation deals with the release 4 of the GOCE gravity field model from the direct method. This model is obtained with the reprocessed GOCE data from November 2009 through June 2012 and will be delivered to ESA in March 2013.

The three-axes gradiometer (approximately radial, along-track, normal to the orbit plane) provides gravity gradients that are measured with a high accuracy only within its measurement bandwidth of approximately 0.005 to 0.1 Hz. Due to this instrumental behavior, the gravity gradient observation equations must be filtered. Within the direct numerical method this has been done using a band pass filter and for its past three releases a 8 -100 seconds band pass filter was used. Now for the new release 4 a wider band pass of 8 - 120 seconds was applied. In contrast the GOCE GPS-SST data are only used to geolocate the gradients. The low-to-medium degree spherical harmonic coefficients of the gravity field are determined using GRACE GPS-SST and KBR data, as well as LAGEOS SLR data. All data are combined at normal equation level, which are solved using Cholesky decomposition. We apply the spherical cap regularization to stabilize the low-order spherical harmonic coefficients for the polar gaps in the GOCE data. Furthermore, Kaula regularization is used at the high degrees.

A geodetic validation of the ESA models is done within EGG-C. We present additional validation results using an independent oceanographic evaluation method. The Mean Dynamic Ocean Topography and the associated mean geostrophic currents were computed for different geoid models together with an altimetric Mean Sea Surface. These derived mean currents are compared with observed mean geostrophic ocean currents using SVP buoy velocity data. The differences between the geostrophic currents derived from gravity field models and inferred from drifter data are then analyzed as a function of spatial resolution (down to 100 km) and location.