



Enhanced Mean Dynamic Topography and Ocean Circulation Estimation using GOCE Preliminary Models

Per Knudsen (1), Rory Bingham (2), Ole Andersen (1), and Jerome Benveniste (4)

(1) DTU Space, National Space Institute, Geodesy, Copenhagen, Denmark, (2) Newcastle University, Dept. of Civil Engineering and Geosciences, Newcastle upon Tyne, UK, (3) DTU Space, National Space Institute, Geodesy, Copenhagen, Denmark, (4) European Space Agency – ESRIN, Directorate of Earth Observation Programmes EO Science, Frascati, Italy.

The Gravity and Ocean Circulation Experiment - GOCE satellite mission will measure the Earth gravity and geoid with unprecedented accuracy leading to substantial improvements in the modeling of the ocean circulation and transport. In this study of the performance of GOCE, the new preliminary gravity models have been combined with the new DTU10MSS mean sea surface model (MSS) to construct global GOCE satellite-only mean dynamic topography models (MDT). The computation of the MDTs followed the recommendations from the GOCE User Toolbox (GUT) tutorials and was carried out using GUT tools. Applying the so-called space domain method a global geoid grid was computed from the GOCE spherical harmonic coefficients. Subsequently, the MDT was obtained by filtering the MSS-geoid differences.

At a first glance, the GOCE MDT display the well known features related to the major ocean current systems. A detailed look, however, reveals that the improved gravity provided by the GOCE mission has enhanced the resolution and sharpened the geometry of those features. A computation of MDT slopes clearly display the improvements in the description of the current systems. In the North Atlantic Ocean, the Gulf Stream is very well defined and the Labrador and the Greenland currents are clearly displayed. Furthermore, different branches of the North Atlantic Current are seen. In the North Pacific Ocean, the Kuroshio and its extension are well recovered, also with its branches. In the Southern hemisphere, both the Aghulas and the South Atlantic current systems are very clearly displayed. In the Antarctic Circumpolar Current system different flow paths are revealed. The results of this preliminary analysis using preliminary GOCE gravity models clearly demonstrate the potential of GOCE mission. Future GOCE models are expected to further enhance studies of the ocean circulation.