Geophysical Research Abstracts
Vol. 15, EGU2013-3257, 2013
EGU General Assembly 2013

Recovering Finer Scale Structures of the Global Mean Ocean Circulation using GOCE Gravity Models

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The Gravity and steady state Ocean Circulation Explorer (GOCE) satellite mission measures Earth's gravity field with an unprecedented accuracy at short spatial scales. Preliminary results have already demonstrated a significant advance in our ability to determine the ocean's general circulation. The improved gravity model provided by the GOCE mission has enhanced the resolution and sharpened the boundaries of those features compared with earlier satellite only solutions. Calculation of the geostrophic surface currents from the MDT reveals improvements for all of the ocean's major current systems. Furthermore, the finer scale features, such as eddies, meanders and branches of the current system are visible.

In this study, more recent gravity models from GOCE are combined with the DTU10MSS mean sea surface to construct a global mean dynamic topography (MDT) model. Both satellite only models such as the GOCE release 3 models and the combination models such as the Eigen-6c, have been applied. The model differences are described in the spectral domain in order to enhance the filtering to optimize the reduction of the remaining geoid signals and the recovery of the MDT and the associated geostrophic circulation. The results demonstrate that fine scale structures in the ocean circulation with speeds down to 5 cm/s may be recovered using gravity field models based on GOCE.