DTU13MDT – a Global GOCE Derived Mean Dynamic Topography

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The Gravity field and steady-state Ocean Circulation Explorer (GOCE)

Its objectives are to improve understanding of:

- global ocean circulation and transfer of heat
- physics of the Earth's interior (lithosphere & mantle)
- topographic processes, ice sheets and sea level change
Computation of a MDT

Basically, the Mean Dynamic Topography is obtained through:

1. Subtracting a MSS and a GOCE geoid
   \[
   \text{MDT} = \text{MSS} - \text{Geoid}
   \]

2. Filtering to remove unmodeled parts of the geoid

\[
\text{MSS} = \text{Geoid} + \text{MDT}
\]
The GOCE MDT (r.1 DIR) display the well-known features with enhanced resolution and sharpened boundaries. Compute surface geostrophic currents \((u,v)\) to enjoy details

MSS – Geoid comparisons

Figure 2: Isotropic mean for the differences between various EGMs and DTU13MSS

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New model - DTU13MDT:

Similar to DTU12MDT updated with

- DTU13MSS
- Eigen-6C3

Improved mainly in the Arctic and in the equatorial region.

20 year reference period
Consistent with the new AVISO altimetry reference period.
Geostrophic Currents (DTU13MDT):

Speed (m/s)

| 40- cm/s | 0.40 |
| 30- cm/s | 0.30 |
| 20- cm/s | 0.20 |
| 10- cm/s | 0.10 |
| 0.00 cm/s | 0.00 |

Direction

| South | 60 |
| East  | 30 |
| North | 0  |
| West  | -30 |
| South | -60 |

DTU Space
National Space Institute
GV Speeds (DTU13MDT vs Maximenko):

- DTU13MDT
- Maximenko

Speed (m/s)

- 40-
- cm/s
- 0.40
- 0.30
- 0.20
- 0.10
- 0.00

Direction

- 0
- 30
- 60
- 90
- 120
- 150
- 180
- 210
- 240
- 270
- 300
- 330

GEOCE
GV Directions (DTU13MDT vs Maximenko):
North Pacific Ocean:

DTU_EGU13_MDT

Maximenko
Status:

The results confirm the potential of the GOCE mission in ocean modelling:

• the resolution of the MDT has been improved
• the estimated surface current speeds have been increased - also minor currents and fronts are shown

Issues:
• improve filtering – full ECV matrix,
• optimal combination of GOCE and MSS,
• both...
• include other data for regional enhancement
  • surface gravity
  • drifter velocities, etc.