The New CNES-CLS18 Mean Dynamic Topography

Mulet, S.; Rio, M.; H.; Etienne, H.; Dibarboure, G.; Picot, N.
CLS, FRANCE; CNES, France; Esa-Esrin, Italy
smulet@groupcls.com

New Dynamic Topography has been computed for the global ocean using a similar method as described in Rio and Hernandez (2003), Rio et al. (2005), Rio et al. (2009), Rio et al. (2015). Compared to the previous CNES-CLS13 field, the main improvements are:

- The use of the latest GOCCDS model (Mayer-Gonzalez et al., 2015) based on 10 years of GRACE data and the entire processed GOCE data (Nov 2009-Oct 2013).
- An up-scaled dataset of dynamic heights and drifting buoy velocities including Argo float surface velocities (1993-2016).
- The use of an improved processing to compute the first guess.
- The use of an improved dynamic model to extract the geostrophic component of the buoy velocities.
- Estimation was done on a 1/2° resolution grid (instead of 1/4° for CNES-CLS15).

Method

Updated dataset of synthetic mean heights

- Computation of instantaneous dynamic height relative to the depth Pref (h Pref, Pref, x, y, z, t) from 15/3D (Gounet et al. 2014).
- The barotropic component of the sea level variability is computed for the different reference depths (Gounet et al., 2006) and removed to compute mean dynamic:

\[ \delta h_{\text{Pref}, r} = h_{\text{Pref}, r} - h_{\text{Pref}} \]

- The resulting quantity is called the reference dynamic is the smaller scales of the mean dynamic:

\[ \delta h_{\text{Pref}, r} = h_{\text{Pref}, r} - h_{\text{Pref}} \]

The geostrophic velocity is the main component of the mean dynamic:

\[ \nu_{\text{geo}} = \frac{\partial \delta h_{\text{Pref}, r}}{\partial t} \]

Comparison with independent drifter mean velocities from ENVISAT

The mean dynamic height derived from the drifter trajectories and compared to the drifter velocities as a function of coastal dynamics and ocean circulation.

Conclusion

A new global 1/8° CNES-CLS18 Mean Dynamic Topography (MDT) and associated mean geostrophic currents has been estimated for reference period 1993-2016 (the same reference period than the CNES/Altit/Sea level anomalies presented in Mialon et al., 2017). The new global MDT field is computed over all ocean areas and it is available for download from the CLS website. The main improvements are:

- The use of new satellite altimeter data, including ENVISAT data during its operational phase.
- The use of new model developments, including the new dynamic topography model.
- The use of new processing techniques, including the use of new software tools.

The new MDT field is available for download from the CLS website. It is provided in a grid format, with a resolution of 1/8°. The data is delivered in netCDF format, with a time series covering the period 1993-2016. The data is available for both research and operational use. It is hoped that the new MDT field will be used in a variety of applications, including oceanography, climate studies, and coastal management.