

Mean Dynamic Topography Based on the Grace GGM02 Model and Altimeter MSS: Can we Capture Subgyre Structures by use of Adaptive Filters?

Marcio L. Vianna (marcio@vmoceanic.com.br)^{*1,3}, Don Chambers^{*2} (chambers@csr.utexas.edu) and Viviane Menezes (viviane@vmoceanic.com.br)^{*3}

^{*1} Instituto Nacional de Pesquisas Espaciais, INPE

^{*2} University of Texas at Austin, Center for Space Research

^{*3} VM Oceânica Ltda, S.J. Campos, Brasil

A high resolution Mean Dynamic Ocean Topography (DOT) has been constructed by differencing of the GRACE Gravity Model 02 (GGM02), based on 363 days of data, from a multi-satellite Mean Sea Surface (GSFCMSS00) both mapped into a 0.25 x 0.25 degree grid. This DOT exhibits correlated noise, especially in the form of quasi-meridional striations, caused mostly by correlated errors in the GRACE geoid. This noise can be filtered out to make feasible the recovery of Gyre-scale structures at resolutions of ~400 km with the use of Gaussian smoothing, but the mesoscale subgyre structures are lost due to excessive smoothing. However, we found that a adaptive empirical orthogonal method based on EOF and Singular Spectrum Analysis (SSA), both utilizing the space covariance structure of the data set, is more efficient in removing this kind of noise. The main advantages of this filter are: it works well with short data sets; it does not lose boundary points; it does not smooth out large peaks; and it is able to efficiently separate signal from noise, which can be further analysed. The resultant DT is able to recover subgyre-scale geostrophic circulation associated to Western Boundary Currents (Gulf Stream, Kuroshio, etc), and is consistent with estimates obtained from a high-resolution Boyer-Levitus (BL) climatology. Surprisingly, in the South Atlantic (SA) the Brazil Current system and the SA Subtropical Gyre appears to be more consistent with the double gyre schematics of Tsuchiya (1985) than with the popular one presented in many papers by Stramma and collaborators. In contrast with Stramma, it exhibits a slender Brazil Current/Return Current cell and a signature of a Subtropical South Atlantic Countercurrent around 30 S. This result is consistent with several depth- referenced DOTs obtained from the BL climatology.