Geophysical Research Abstracts
Vol. 17, EGU2015-12353, 2015
EGU General Assembly 2015

North Atlantic teleconnection patterns signature on sea level from satellite altimetry

Isabel Iglesias (1,2), Clara Lázaro (2,3), M. Joana Fernandes (2,3), Luísa Bastos (2,3)

(1) Universidade do Porto, Praça Gomes-Teixeira, 4099-002 Porto, Portugal (isabel.iglesias.fdz@gmail.com), (2) Centro Interdisciplinar de Investigação Marinha e Ambiental (CIIMAR), Universidade do Porto, Rua dos Bragas 289, 4050-123 Porto, Portugal, (3) Universidade do Porto, Faculdade de Ciências, Rua do Campo Alegre, 687, 4169-007 Porto, Portugal

Presently, satellite altimetry record is long enough to appropriately study inter-annual signals in sea level anomaly and ocean surface circulation, allowing the association of teleconnection patterns of low-frequency variability with the response of sea level. The variability of the Atlantic Ocean at basin-scale is known to be complex in space and time, with the dominant mode occurring on annual timescales. However, interannual and decadal variability have already been documented in sea surface temperature. Both modes are believed to be linked and are known to influence sea level along coastal regions. The analysis of the sea level multiannual variability is thus essential to understand the present climate and its long-term variability.

While in the open-ocean sea level anomaly from satellite altimetry currently possesses centimetre-level accuracy, satellite altimetry measurements become invalid or of lower accuracy along the coast due to the invalidity of the wet tropospheric correction (WTC) derived from on-board microwave radiometers. In order to adequately analyse long-term changes in sea level in the coastal regions, satellite altimetry measurements can be recovered by using an improved WTC computed from recent algorithms that combine wet path delays from all available observations (remote sensing scanning imaging radiometers, GNSS stations, microwave radiometers on-board satellite altimetry missions and numerical weather models).

In this study, a 20-year (1993-2013) time series of multi-mission satellite altimetry (TOPEX/Poseidon, Jason-1, OSTM/Jason-2, ERS-1/2, ENVISAT, CryoSat-2 and SARAL), are used to characterize the North Atlantic (NA) long-term variability on sea level at basin-scale and analyse its response to several atmospheric teleconnections known to operate on the NA. The altimetry record was generated using an improved coastal WTC computed from either the GNSS-derived path Delay or the Data Combination methodologies developed by University of Porto (Fernandes et al., 2010; Fernandes et al., 2013). Regular 0.25°x0.25° latitude-longitude grids were generated at a 10-day interval for the NA Ocean (60°W-5°W, 5°N-60°N) using optimal interpolation with a realistic space-time correlation function (Lázaro et al., 2013). These grids are used to inspect the response of sea level anomalies to several teleconnection patterns as well as the NA variability on annual and longer timescales. The teleconnection patterns selected are the ones that have influence on the NA basin: North Atlantic Oscillation, East Atlantic pattern, East Atlantic/Western Russia pattern, Scandinavia pattern, Western Mediterranean Oscillation index, El Niño Southern Oscillation, Tropical North Atlantic Index, and Atlantic Multidecadal Oscillation.

Acknowledgments: RAIA tec (0688-RAIATEC-1-P) project. The RAIA Coastal Observatory has been funded by the Programa Operativo de Cooperación Transfronteriza España–Portugal (POCTEP 2007–2013).

References:

Fernandes M.J., C. Lázaro, A.L. Nunes, N. Pires, L. Bastos, V.B. Mendes (2010). GNSS-derived Path Delay: an approach to compute the wet tropospheric correction for coastal altimetry. IEEE Geosci. Rem. Sens Lett., Vol. 7, NO. 3, 596 – 600, doi: 10.1109/LGRS.2010.2042425.

Lázaro, C., M. J. Juliano, M. J. Fernandes (2013): Semi-automatic determination of the Azores Current axis using satellite altimetry: application to the study of the current variability during 1995-2006. Advances in Space Research, Vol. 51(11), pp. 2155-2170, doi:10.1016/j.asr.2012.12.021.

Fernandes, M. J., A.L. Nunes, C. Lázaro (2013). Analysis and Inter-Calibration of Wet Path Delay Datasets to Compute the Wet Tropospheric Correction for CryoSat-2 over Ocean. Remote Sensing, 5, 4977-5005.