Differences between local and remote interannual climate forcings acting on the Brazilian Large Marine Ecosystems

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Large Marine Ecosystems (LMEs) are units defined based on the differences in hydrographic regimes, bathymetry, productivity and trophycally dependent populations and were established for assessment and management of marine resources and control of degradation of the coastal areas around the world. Three LME are located in the Brazilian domain, the North, East and South LMEs. In this study the influence of interannual climate variations on Brazilian LMEs are investigated. The South Atlantic is subject to local climatic modes, such as the Interhemispheric Sea Surface Temperature (SST) gradient, represented by the Tropical South Atlantic (TSA) and Tropical North Atlantic (TNA) indices and Antarctic Oscillation mode, represented by Antarctic Oscillation (AAO) index. The remote forcings considered in this work are El Niño Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO). Total and partial correlation (95% significance) analyses of climate indices versus SST, wind stress, sea level pressure (SLP) and outgoing long wave radiation (OLR) were calculated. The data series used were detrended and filtered to retain the interannual (2 to 7 years) variability. Correlations were carried out separately for the cold (1948/1976) and warm PDO phase (1977/2008). Results point to higher correlations between wind stress anomaly, SLP anomaly, SST anomaly (SSTA) and the Niño 3 index for a large part of the South Atlantic during the PDO warm phase than in the cold phase. The North Brazil LME region is strongly influenced by El Niño, with a maximum positive correlation between SSTA and Niño 3 found with 7 months lag and a positive correlation between this index and wind stress with a maximum time lag of 2 months. The East LME unit appears to be influenced in a very different way in its southern and northern portion, suggesting that management actions for the adaptation or mitigation for possible climate variability changes needs to consider this difference. The AAO is negatively correlated with SSTA between 20° and 35°S, being the sole climate index showing significant correlations in this area. Another aspect observed is that in the North region of the basin the correlation between AAO and SSTA seems to be intensified by the TSA interaction.

The next step of this work will be to use the Regional Ocean Modeling System (ROMS) with a biogeochemical component to evaluate the impacts of climate variability on the LMEs biological productivity.

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