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The effect of atmospheric variability at intra-seasonal time scale on the SST of the Southwestern Atlantic Continental Shelf

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The Southwestern Atlantic Continental Shelf is characterized by large SST variability which origin remains unknown. In this work, we use blended SST data provided by NOAA CoastWatch Program, which combine the information coming from infrared and microwave sensors to provide daily images of an intermediate spatial resolution (11 km) with a noise floor of less than 0.2 °C. The data base starts at the middle of 2002, when an increase in signal variance is observed due to the fact that the Advanced Microwave Scanning Radiometer became available and as a consequence to its near all-weather coverage. Several years of observations are thus available, and even though the temporal and spatial resolution of these data is intermediate, they are reasonable for observing and characterizing the most significant patterns of SST variability in the (atmospheric) synoptic to intra-seasonal time scales, so as to help on understanding the physical processes which occur in the area and their forcing mechanisms. As we hypothesize that most of the variability in those time scales is wind forced, the study is complemented with the use of atmospheric observations -coming from remote sensing and reanalysis-.
To perform the analysis, the long-term trend, inter-annual and seasonal variability are subtracted to the SST data to obtain the signal on intra-seasonal time scales. Then, Principal Components (EOF) analysis is applied to the data and composites of SST and several meteorological variables (wind, sea level pressure, air temperature, OLR, etc.) are computed for the days when the leading modes are active. It is found that the first three modes account for more than 70% of the variance. Modes 1 and 2 seem to be related to atmospheric waves generated in the tropical Pacific. Those waves, through atmospheric teleconnections, affect the SST on the southwestern South Atlantic Continental Shelf very rapidly. The oceanic anomalies exceed 0.7°C and are quite persistent. Mode 2 seems to be forced by an atmospheric 3-4 mode and might be related to SAM.
Besides showing the impact of intra-seasonal atmospheric variability on the ocean at mid latitudes, the knowledge of the connections between the ocean and the atmosphere could aid on improving the ocean predictability on those time scales.