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Salinity's Role in Tropical Atlantic Instability Waves: new knowledge from salinity remote sensing

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Tropical Atlantic instability waves (TIWs) play important roles in the dynamics of the tropical Atlantic Ocean and related climate variability. Previous studies based on satellite-derived sea surface temperature (SST) data and mooring observations suggest that these waves are the most energetic in the eastern equatorial Atlantic and during late (boreal) spring and early summer. Satellite remote sensing of sea surface salinity (SSS) from SMOS and Aquarius provides a unique vantage point to identify new features of these waves in terms of zonal and seasonal variability. Aquarius SSS data reveal that the TIWs remain energetic in the western equatorial Atlantic despite a much weaker SST signature. Surface perturbation potential energy (PPE), the source of the downward potential energy propagation associated with the TIWs, has a larger contribution by SST (than by SSS) in the east but is primarily due to SSS in the west. The co-variability between SSS and SST also has significant contribution to surface PPE across the basin. While surface PPE is large in late spring and early summer in the east, it is also large during late summer and early fall in the west. The latter is associated with the retroflection of the North Brazil Current into the North Equatorial Countercurrent in the west during these times, carrying with it the fresh water from the Amazon River outflow to set up a large meridional salinity (and thus density) gradient.