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South Atlantic Circulation and Salinity: An Integrated Observational and Modeling Investigation

A research proposal submitted to the Joint Process to Select an International Science Investigating Team for the Aquarius/SAC-D Observatory

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Summary

This project seeks to assess the degree to which Aquarius SSS (sea surface salinity) data can be used to improve our understanding of the variability of the South Atlantic circulation. Our scientific goal is to determine the dominant modes of large-scale variability of the South Atlantic circulation and their impacts on the meridional overturning circulation and on the currents and thermohaline structure of the eastern shelf of South America. To achieve this goal we propose a US-Argentina collaborative program whose specific objectives are: 1) determine the dominant modes of variability of the South Atlantic circulation and thermohaline structure along with their relation to interocean fluxes, atmospheric forcing, and internal ocean processes; 2) Assess the relation between SSS and other modes of oceanic (e.g., SSH, SST) and atmospheric variability (e.g., E-P, wind-stress curl, etc) and determine the utility and limitations of Aquarius data; 3) characterize the spatial and temporal variability of the southwestern Atlantic shelf circulation and determine the dynamical mechanisms controlling its interactions with the deep-ocean circulation; 4) assess the utility of Aquarius SSS data to improve the skill of modeling products. To address these objectives we propose a modeling and observational project that will not be limited to the analysis of extant data sets but includes the development of new models and the acquisition of new observations.

The modeling, data analysis, and Cal/Val activities proposed herein will contribute to preparations for the use of Aquarius data and help to identify scientific problems that can only be addressed through the use of SSS information. Scientifically this project will contribute to further our understanding of climate variability. The meridional overturning circulation is an important controller of climate change and this project will advance our understanding of the mechanisms that regulate the low-frequency variability and interoceanic exchanges of one of its most important components. By developing improved models of coastal circulation over the shelf this project will contribute also to the understanding of the rich ecosystems along the coast of South America, and to the development of biological and geo-chemical projects of this region. The identification of cross-shelf exchange mechanisms (and regions) will contribute to our understanding of carbon cycles and the development of future observational programs.

The research team responsible for this project has a record of cooperative research on southern hemisphere oceanography that extends for more than a decade. It includes investigators from the US and Argentina with extensive experience in modeling, remote sensing, and collection and analysis of in-situ observations. The team includes senior members, with more than 20 years of research experience, as well as young scientists. The project proposed herein will not only benefit from the experience and expertise of team members but also from their extensive connections to other scientists and institutions in South America and Europe. Through these connections we hope to further contribute to the Aquarius mission.