Interannual Variability of the Meridional Transports across the SAMOC Basin-wide Array (SAMBAR)

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Executive Summary

The meridional overturning circulation (MOC) is a primary mechanism for the transport and storage of heat, freshwater, oxygen and carbon by the ocean, with a large impact on climate and its variability. Changes in the MOC have been linked to past climate variations in geological periods. The MOC and the deep ocean circulation also contribute to climate variability on shorter timescales. An important component of the MOC in the Atlantic (AMOC) is the import of warm and salty waters from the Indian Ocean into de Atlantic, known as the Agulhas leakage. Recent studies show that the Agulhas leakage may be increasing in response to anthropogenic climate change. It is natural to assume that the increasing leakage will affect the AMOC, in addition to the expected weakening associated with global warming and ice melt in Greenland and the Arctic region.

The South Atlantic Meridional Overturning Circulation (**SAMOC**) program started in 2007, as an international cooperation among institutions from Brazil, Argentina, South Africa, the USA, France, the UK, Germany and other European countries. SAMOC is endorsed by **CLIVAR** and is being coordinated within the framework of the European Union H2020 project **AtlantOS** and the Brazilian National Institute of Science and Technology (INCT) Mar-COI. The initial stages of SAMOC were conducted as part of Project **SAM**, funded by the U.S. NOAA in cooperation with Argentina and Brazil. The Brazilian contribution is a component of the GOOS-Brazil Program and since 2011 has been funded by the São Paulo State funding foundation (FAPESP) through Projects SAMOC-BR (grant 2011/50552-4, 2011–2016) and SAMBAR (grant 2017/09659-6, 2017–2022). So far, SAMOC produced the first dedicated continuous daily time series of the AMOC strength in the South Atlantic.

SAMBAR is a new contribution to SAMOC aiming at a better understanding of the interannual variability of the heat content and meridional transports across the SAMOC Basin-wide Array (SAMBA) and the impacts on the South Atlantic Circulation, on the Regional Climate and on the MOC stability. SAMBAR will maintain and enhance the existing observing array with the deployment of new instruments and the conduction of oceanographic cruises (Fig. 1). The planned research, which also includes data analyses and numerical modeling, will be carried out through a synergistic collaboration amongst a large team of first-class international scientists.

Broader Impact: SAMBAR has high potential for more immediate societal benefits and economic impacts. The entire Brazilian coastal zone is exposed and vulnerable to the Atlantic Ocean. Slight changes in currents and thermodynamic properties can lead to dramatic impacts on the regional climate, on the sea level height, on coastal geomorphology and on the coastal ecosystems. The better knowledge of the large-scale processes in the South Atlantic is essential for the proper design of coastal observing systems and most effective policies for understanding the impacts of climate changes, for mitigation, adaptation and for protection of the environment.

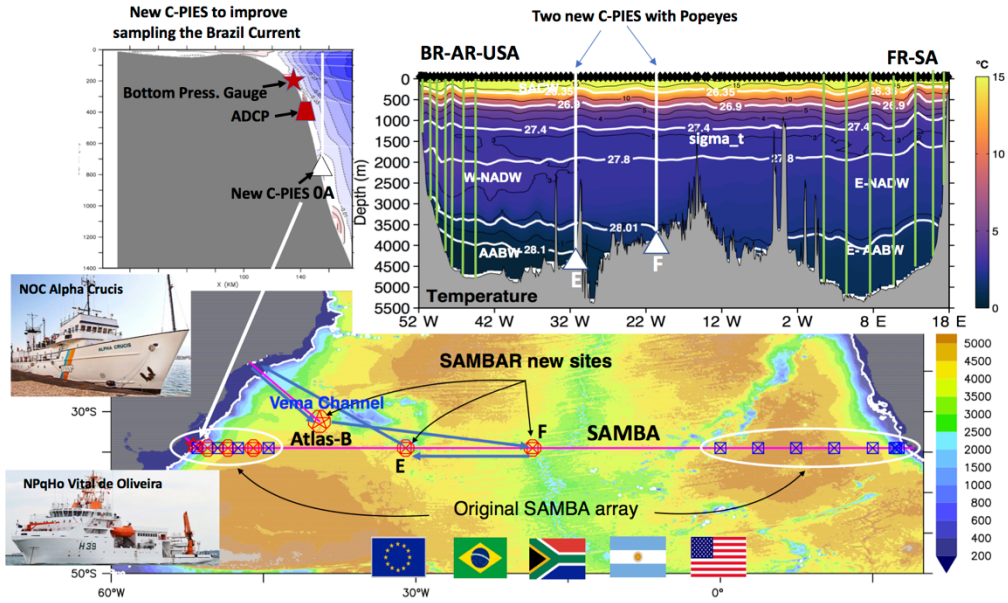

Fig. 1: Schematic design of SAMBAR. It will include the deployment of an Atlas-B buoy in the Vema Channel, one new C-PIES near the western boundary (**0A**) and two C-PIES with Popeyes datapods near the Mid Atlantic Ridge (**E** and **F**). The cruises will count with the support of the Brazilian vessels ***NOC Alpha Crucis*** and ***NPqHo Vital de Oliveira***.

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