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GoodHope : A study and monitoring of the Indo-Atlantic connections. An international cooperative project. A process study and a contribution to CLIVAR - Southern Ocean

The GOODHOPE Team

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The Southern Ocean (SO) plays a unique role in coupling the ocean to the atmosphere and cryosphere. Variations in the mechanisms responsible for this coupling are thought to be linked to the global climate variability. The state of observations and modelling of the Southern Ocean is not as well-developed as in other regions of the ocean and atmosphere. While major achievements were made during the WOCE/JGOFS era, we still have only an incomplete glimpse of the mean state and variability of the Southern Ocean, its coupling with the atmosphere and cryosphere, and the zonal and meridional fluxes. SO observations are dramatically sparse in space and time; consequently, further emphasis on exploratory investigations in the Southern Ocean needs to be placed than in better-sampled ocean basins. While the Southern Ocean dynamics is suspected to have a major role in the global ocean circulation and present day climate, our understanding of its three-dimensional dynamics, variability, and the impact of such variability on the climate system, is rudimentary. The GoodHope project aims to partially fill in this knowledge gap by periodic observations along a line between the African and Antarctic continents. The objectives are fourfold:

- A better understanding of the Indo-Atlantic interocean exchanges (in term of water masses, heat and fresh-water budgets) and their impact on the global thermohaline circulation and present climate;

- A better understanding of the impact of these interocean exchanges on the local

climate of the African continent;

- A through characterization of the variability of particular dynamical features (Antarctic Circumpolar Current, frontal systems, ...);

- A quantification of the local air-sea exchanges and their role on the global heat budget (with emphasis on the intense exchanges in the Agulhas Retroflection region).

Due to the large extent of the section and the need of a long-term commitment, this project is conducted in co-operation with various scientific institutes of different countries. To be quantitative, the observations should meet the WOCE standards. The chokepoint monitoring is best done using a combination of the following observational tools: Altimetry, high density XBTs, XCTDs, profiling floats, subsurface floats, drifters, thermosalinograph; oxygen, nutrients, and chlorophyll samples. Complete CTD sections (hydrography and biogeochemistry) will be carried out every 2 to 5 years. Argo profiling floats will be deployed over the entire section. The project has started in February 2004. Two XBTs lines and a CTD transect with ARGO floats deployment have been accomplished.

The GoodHope line extents from Cape Town southeast along Jason groundtrack 133; at the Greenwich meridian it turns south eventually intersecting the German Antarctic base Neumayer. The advantages of this positioning are severalfold: he northern part of the section overlaps the U.S. ASTTEX programme dedicated to quantifying the Indian leakage to the Benguela region in a high space-time resolution mode; the southern part (south of 50°S) of the line overlaps with the German WECCON mooring programme dedicated to the Weddell Sea circulation and water masses. In between the ASTTEX and WECCON arrays two Pressure Inverted Echo Sounders have already been deployed during 2003; the monitoring line lies close to the annual “ferry service” for the S.A. Agullas from Cape Town to the German Antarctic base Neumayer: no more than an extra-day is required to accommodate this line.

The project focuses on high resolution measurements in order to resolve the mesoscale features and unalias the observations that are devoted to the measurement of global climate variability and climate change, in addition to providing basic information about the seasonality and mean state along the section. It follows that our goal is an extended deployment in time of all the actual measurements and an expansion of the number of actual moorings.