The SAMOC (South Atlantic Meridional Overturning Circulation) program

Renellys C. Perez, Silvia L. Garzoli, Alberto R. Piola,
Sabrina Speich, Edmo Campos, Christopher S. Meinen,
Michael Roberts, and the SAMOC team

- **Overarching goal of the SAMOC initiative** is to observe and understand the mechanisms that control the mean and time-varying MOC in the South Atlantic and the interocean exchanges

- SAMOC is an **international cooperation** between Argentina, Brazil, France, South Africa, and the USA with collaborators from Germany, Russia, Spain, UK

- **Funding**: NOAA, CNPq/INCT, FAPESP/FACEPE, IAI, IFREMER/ANR, DEA

More details:
[http://www.aoml.noaa.gov/phod/SAMOC_international/](http://www.aoml.noaa.gov/phod/SAMOC_international/)
AMOC pathway into South Atlantic affects North Atlantic SST (explains warming)

- NCAR CCSM3 model forced with fluxes isolated from the Atlantic only vs. outside Atlantic
- Flux forcing outside the Atlantic induces large heat advection south of Africa following the MOC pathway
- The South Atlantic MOC pathway can modulate warming in the Atlantic Ocean

Lee et al. (2011)
• The South Atlantic not a passive conduit for NADW and other water masses
• Models show largest water mass transformations occur in highly energetic boundary regions
• AAIW created in SW Atlantic by surface/deep waters
• AAIW transformed into surface waters in Cape Basin

Garzoli and Matano (2011)
SAMOC
Update on observational components
SAMOC observational network “vision”

- SAMoc Basin-wide Array (SAMBA), Oblique Goodhope transect, Drake Passage
- Oct 2014: Western boundary SAMBA hydrography, PIES/CPIES telemetry cruise
- Oct 2014: Eastern boundary SAMBA tall mooring deployment, CPIES telemetry cruise
- Dec 2014: Oblique Goodhope transect PIES deployment cruise

Seeking funding for augmenting, expanding, or reinstating components of SAMOC
AMOC observations

Moored arrays

Trans-basin measurements
In both 2012 and 2013, **SAMBA doubled** in size!
2012-2013: 3 CPIES, 1 ADCP, 1 BPR deployed on **western boundary**
2013: 8 CPIES, 2 ADCPs deployed on the **eastern boundary**
Oct 2014: 10 short/tall moorings will be deployed on the **eastern boundary**
Shelf – deep ocean

The mooring array off Rio Grande is designed to serve as the shelf boundary of the western portion of SAMBA

- Main regions where field activities are planned within scope of INCT-Mar ICO
- **Hydrographic/velocity measurements** by **Argentina** and **Brazil** on shelf will aid in SAMBA MOC calculations until more moorings funded
- **Mooring servicing** and **data telemetry** done on these cruises
Datapod technology: ABIISS(US)/SYREDOMY (France)

- Successful 6 month US ABIISS test deployment in the Florida Straits (800 m)
- Launch of two data pods and data transmission via satellite
- Instrument recovery in fall 2014

- Successful data transmission via satellite from first set of French SYREDOMY messengers (example: SAMOC/SAMBA CPIES, 5300 m)
• To assess impact of Indo-Atlantic exchange on SAMOC, **7 PIES** will be deployed in 2014 along **oblique Goodhope transect** (JASON-2 ground track) out to Agulhas Ridge
• Red diamonds: Planned locations of PIES
• Gray line: CLIVAR Goodhope line sampled twice/year
• Providing a wealth of information about the **variability** and **dynamics** of the ACC
• Left panel: **cDrake** locations
• Right panel: **Drake Passage Underway Time Series** transects
SAMOC
Science results

Publications: http://www.aoml.noaa.gov/phod/SAMOC_international/

Presentations at US AMOC 2014 Meeting:

Session 3: S. Dong “Meridional changes of the SA MOC from satellite measurements”

Poster TT1: S. Garzoli “Tracing the lower limb of the AMOC in the SA”

Poster TT1: M. Goes “An optimal XBT based monitoring system for the SA MOC at 34S”

Poster TT1: C. Meinen “Observed DWBC variability at 34.5S during 2009-2012”

Poster TT2: C. Schmid “Variability and uncertainty of meridional transports in the SA”

Poster TT4: R. Perez “Simulating MOC water mass pathways and variability in the SA”
Pilot array provides daily estimates of South Atlantic MOC

**MOC** estimated from a daily time series of dynamic height from inverted echo sounders (PIES/CPIES)

- An 20 month long pilot array and a novel technique using model output and Argo data helps determine the daily MOC strength at 35°S

- MOC time series compares favorably with XBT derived time series

- MOC variability is as large at that at 26°N, with both boundary flows contributing equally to the variance

- Eastern boundary array was reestablished in fall 2013 by France and South Africa

Meinen et al. (2013)
Future expansion, augmentation, reinstatement

- **Short/tall moorings** (T, S, p, v) on the **western boundary** to better measure transport (BC, DWBC) and water mass (NADW) changes
- **PIES/datapods** in the **interior**
- **Drake Passage moorings** for ACC transport
- Trans-basin hydrographic/SADCP/tracer cruise
- **Challenges**: Funding, obtaining ship time (cruises by international partners)*

*New R/V: 2012, **S.A. Agulhas II** (133m, South Africa), **Alpha Crucis** (64 m, Brazil) 2014, **Sonne** (Argentina, 97 m)
SAMOC WORKSHOP
South Atlantic circulation variability and change: integrating models and observations

Buenos Aires, Argentina
December 1-5, 2014