AtlantOS

OCCIPUT
OceaniC Chaos – ImPacts, strUcture, predicTability

Observational imprints of the low-frequency chaos in the ocean: improving the climate monitoring system in the South Atlantic

- **Postdoctoral Research Associate** (15 months, renewable once)
- **Location:** MultiscalE Ocean Modelling (MEOM) team, Laboratoire de Glaciologie et Géophysique de l'Environnement (LGGE), Grenoble, FRANCE.
- **Salary** (H2020 funding): based on skills & experience, within national standards.

Applications will be considered until the position is filled

Applications (letter of motivation, detailed CV, list of publications, name/email of referees) and/or informal enquiries should be directed to both T. Penduff (thierry.penduff@univ-grenoble-alpes.fr) and S. Speich (speich@lmd.ens.fr)

The main goal of AtlantOS-WP5 is to improve the monitoring of climate variability and the observational sampling of key variables in the Atlantic ocean, based on the knowledge of their spatio-temporal features and dynamical nature. The proposed study is focused on the South Atlantic subtropical gyre, a key region for the exchanges of heat, freshwater and carbon between the Atlantic and neighboring basins (Cimatoribus et al., 2012). The SAMOC CLIVAR array is being deployed in this region (Garzoli et al., 2012) to monitor the variability of the AMOC and of these transports. The South Atlantic is characterized by a strong mesoscale variability; in this nonlinear regime, the low-frequency variability of AMOC, SST, SSH, Ocean Heat Content (OHC), water mass properties and transports is only partly driven by the atmosphere: a low-frequency chaotic intrinsic variability spontaneously emerges and competes with the forced variablity (*Penduff et al., 2011; Hirschi et al., 2013 ; Arbic et al., 2014; Sérazin et al., 2015; Grégorio et al., 2015*).

The proposed study aims in particular to [1] characterize the structures of the forced and chaotic variabilities of oceanic climate indices at synoptic to multidecadal timescales within and around this basin, in order to [2] optimize the exploitation of available observations, and the observational sampling strategy. We will jointly investigate stallite/in-situ observations and a pioneering simulation performed within the ANR/PRACE OCCIPUT project (Penduff et al., 2014): it consists in a 50-member ensemble of global ocean/sea-ice simulations (1/4° resolution), which were slightly perturbed initially and driven by the same atmospheric variability between 1960 and 2015. The ensemble mean provides an estimate of the atmospherically-forced variability, the ensemble dispersion of the chaotic variability. We will characterize at various scales the forced and chaotic (co)variabilities of dynamical and thermodynamical fields at SAMOC and over the basin, their local and distant imprints on observational data (altimetry, Argo, RAPID, etc), and propose improvements, extensions, or alternative uses of the existing observed data.

The postdoctoral fellow will perform physical/statistical analyses of the ensemble simulation outputs in relation with observations. Scientific questions will concern the balance between forced and chaotic variabilities of oceanic climate indices in and around the South Atlantic, the spatiotemporal structure (scales/patterns) of both variabilities, their coherence with neighboring basins, their imprint on observed variables (SSH, OHC, AMOC, etc).

This study is directed toward a motivated scientist interested in computational and observational oceanography, joint statistical and physical analyses of these large datasets. A PhD in physical oceanography, meteorology, climate science, or geophysical fluid dynamics is required. The ideal candidate would have scientific talents (innovation, publishing, speaking) and computer science skills.

- *Garzoli, S.,M.O. Baringer, S. Dong,R. Perez, and Q. Yao, 2012: South Atlantic meridional fluxes.* ***Deep-Sea Res****.I, 71:21-32*
- *Grégorio, S., T. Penduff, G. Sérazin, J.-M. Molines, B. Barnier, and J. Hirschi, 2015 : Intrinsic variability of the Atlantic Meridional Overturning Circulation at interannual-to-multidecadal timescales.* ***J. Phys. Oceanogr****., 45, 7, pp. 1929-1946.*
- *Penduff, T., B. Barnier, L. Terray, L. Bessières, G. Sérazin, S. Grégorio, J.-M. Brankart, M.-P. Moine, J.-M. Molines, and P. Brasseur, 2014 : Ensembles of eddying ocean simulations for climate.* ***CLIVAR Exchanges****, Special Issue on High Resolution Ocean Climate Modelling, 65, Vol 19 No.2, July 2014.*
- *Penduff, T., M. Juza, B. Barnier, J. Zika, W.K.Dewar, A.-M. Treguier, J.-M. Molines, and N. Audiffren, 2011: Sea-level expression of intrinsic and forced ocean variabilities at interannual time scales.* ***J. Climate****, 24, 5652–5670. doi: 10.1175/JCLI-D-11-00077.1.*
- *Sérazin, G., T. Penduff, S. Grégorio, B. Barnier, J.-M. Molines, and L. Terray, 2015 : Intrinsic variability of sea-level from global 1/12° ocean simulations: spatio-temporal scales.* ***J. Climate,*** *28, 4279–4292. doi: http://dx.doi.org/10.1175/JCLI-D-14-00554.1.*