A global probabilistic study of the Ocean Heat Content low-frequency variability: atmospheric forcing versus oceanic chaos

Guillaume Serazin*[1,2,3], Thierry Penduff[2], Alexandre Jaymond[2], Stephanie Leroux[4], Bernard Barnier[2], Laurent Bessières[3], Laurent Terray[3], William Llovel[3], and Jean-Marc Molines[2]

[1]Laboratoire d'études en Géophysique et océanographie spatiales (LEGOS) – CNRS : UMR5566, Institut de recherche pour le développement [IRD], CNES, Observatoire Midi-Pyrénées, INSU, Université Paul Sabatier (UPS) - Toulouse III – 14 avenue Edouard Belin 31400 Toulouse, France

[2]Laboratoire de glaciologie et géophysique de l'environnement (LGGE) – CNRS : UMR5183, OSUG, INSU, Université Joseph Fourier - Grenoble I – Domaine Universitaire 54 Rue Molière - BP 96 38402 ST MARTIN D HERES CEDEX, France

[3]Centre Européen de Recherche et de Formation Avancée en Calcul Scientifique (CERFACS) – CERFACS – France

[4]Institut des Géosciences de l'Environnement (IGE) – IGE – Grenoble, France

Abstract

A global 1/4◦ ocean/sea-ice 50-member ensemble simulation is used to disentangle the low-frequency imprints of the atmospherically-forced oceanic variability and of the chaotic intrinsic oceanic variability (IOV) on the large-scale (10◦ x10◦) ocean heat content (OHC) between 1980 and 2010. The IOV explains most of the interannual-to-decadal large-scale OHC variance over substantial fractions of the global ocean area that increase with depth: 9%, 22%, and 31% in the 0-700m, 700-2000m and 2000m-bottom layers, respectively. Such areas concern principally eddy-active regions, mostly found in the Southern Ocean and in western boundary current extensions, but also concern the subtropical gyres at intermediate and deep levels. The oceanic chaos may also induce random multidecadal fluctuations so that large-scale regional OHC trends computed on the 1980-2010 period cannot be unambiguously attributed to the atmospheric forcing in several oceanic basins at various depths. These results are likely to raise detection and attribution issues from real observations.

*Speaker