Response of biogeochemical tracers to ocean intrinsic variability

Marion Gehlen*[1], Roland Séférian[2], Christian Ethé[3], Sarah Berthet†[2], and Thierry Penduff[4]

[1]LSCE – CNRS : UMR8212 – France
[2]CNRM GMGEC/EST – CNRS : UMR3589 – France
[3]LOCEAN – CNRS : UMR7159 – France
[4]IGE MEOM – CNRS : UMR5001 – France

Abstract

Both eddying ocean simulations and satellite observations tend to support the contribution of intrinsic variability to total variability of physical ocean properties at interannual and decadal timescales. The physical environment has been shown to exert a first order control on the structure of marine ecosystems and biogeochemical processes.
In order to explore the propagation of intrinsic variability of physical properties to biological/biogeochemical processes, an ensemble of NEMO ocean-biogeochemical simulations at 1/4◦ resolution has been carried out. This ensemble counts three members. Each of them has been generated from a control run over the 1958-2002 DFS4.2 period by branching off two simulations on January 1st 1979 and by shifting by one year physical and biogeochemical initial conditions.
This study focuses on the response of ocean carbon fluxes and net primary productivity (NPP) to ocean intrinsic variability. For these two biogeochemical fields, the intrinsic variability accounts for about 5% of the total variability at global average but may locally exceed 40%. Our results show that patterns of intrinsic variability for carbon fluxes closely follow those of physical fields (sea surface temperature or sea surface height) whereas those of NPP do not. This suggests that intrinsic variability of NPP has a greater contribution than carbon fluxes to the total variability of the tropical oceans, and may have implications on the detection of climate impacts on marine ecosystems.

*Corresponding author: marion.gehlen@lsce.ipsl.fr
†Speaker