Geophysical Research Abstracts,
Vol. 11, EGU2009-8723, 2009
EGU General Assembly 2009

On the representation of the ACC circulation around the Kerguelen Plateau in an OGCM

F. Roquet (1), Y. H. Park (1), and G. Madek (2)

(1) LOCEAN-IPSL, MNHN, Paris, France (roquet@mnhn.fr), (2) LOCEAN-IPSL, CNRS, Université Pierre et Marie Curie, Paris, France

Due to its great meridional extent and relatively shallow depths, the Kerguelen Plateau constitutes a major barrier to the eastward flowing Antarctic Circumpolar Current (ACC) in the Indian sector of the Southern Ocean. While most of the ACC transport is deflected north of the Kerguelen Islands, the remainder (5̃0 x 106 m3 s-1) must pass south of the islands, most probably through the Fawn Trough (56°S, 77°E, 2650m) and Princess Elizabeth Trough (64°S, 82°E, 3650 m). Yet, lack of observations in this area still hampers our knowledge on the exact partitioning and its temporal variability of the circumpolar flow through the abovementioned three passages.
We have developed a regional configuration of the Southern Indian Ocean using the eddy-permitting (1/4°) global ocean/sea-ice model NEMO. A 20-year long simulation has been performed, using the open boundary conditions derived from the KAB001 interannual experiment. The KAB001 experiment is characterized by a slight 3D TS restoring in polar areas, which allows the continuous maintaining of adequate bottom properties around Antarctica, and thus yielding a realistic and stable ACC transport (1̃50 x 106 m3 s-1 at Drake Passage).
The main ACC veins detected from satellite and in situ observations are consistently well represented in our regional model. In particular, the presence of a strong topographically controlled northeastward current through the Fawn Trough channelling most of the Enderby Basin water has been confirmed. The lagrangian diagnostic tool ARIANE has been used on the model velocity field to show the ACC circulation splitting into several branches. It also allows a precise diagnostic of the temporal variability of these branches as well as the transformation of water masses along their trajectories. We verified that the area just downstream of the Fawn Trough in the Australian-Antarctic Basin is an outstanding region of enhanced water mass transformation where waters of different origins collide and mix.