Geophysical Research Abstracts, Vol. 9, 10165, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10165

Antarctic Intermediate Water formation and anthropogenic CO_2 uptake

Z. Lachkar (1), J.C. Orr (2), J.C. Dutay (1) and P. Delecluse (3)

(1) LSCE/IPSL, Laboratoire CEA-CNRS-UVSQ, Gif-sur-Yvette, France, (2) Marine Environment Laboratories, Monaco, (3) METEO-FRANCE, CNRM, Paris, France (lachkar@dsm-mail.saclay.cea.fr / Fax : +33 1 69 08 30 73 / Phone : +33 1 69 08 39 73)

Simulated southern extratropical ocean inventories of CFC-11 and anthropogenic CO2 are about 25% lower when eddies are accounted for explicitly in an eddy permitting (eddying) model relative to those inventories in a coarse-resolution (non-eddying) version of the same global ocean model (OPA/ORCA). In the eddying model, the zonal integral CFC-11 inventory lies nearly on top of the GLODAP data estimate; conversely, the OCMIP models typically over-predict the observed inventory in this region, where most of the world ocean's CFC-11 and anthropogenic CO2 is stored. Eddies affect these tracer distributions in large part because they dramatically alter patterns and amounts of SAMW and AAIW formation. The increase in horizontal resolution changes Sverdrup's classical pattern of AAIW formation, which occurs homogeneously along the ACC (as is typically found in coarse-resolution models), to a more realistic pattern where AAIW formation is localized largely in the southeast Pacific near the Drake Passage (as proposed by McCartney). Meanwhile the simulated AAIW layer thins by 32% in the Indian sector, but only by 11% in the Pacific sector. Based on CFC-11 observations, the eddying model's patchier distribution of AAIW formation and the lower inventories of anthropogenic CO2 are more realistic. Here we will further detail the link between AAIW formation and anthropogenic CO2 uptake and storage, while focusing on the key role of mesoscale eddies.