Geophysical Research Abstracts
Vol. 19, EGU2017-5111, 2017
EGU General Assembly 2017

Using transient tracers to estimate decadal changes in Southern Ocean ventilation in an eddying ocean model

Lavinia Patara, Christina Schmidt, Toste Tanhua, and Claus Böning
Helmholtz-Zentrum für Ozeanforschung Kiel (GEOMAR), Kiel, Germany (lpatara@geomar.de)

Decadal changes in ocean ventilation of Southern Ocean water masses is estimated by performing a set of ocean simulations with the ocean model NEMO-LIM2 at 1/4° horizontal resolution (∼15 km grid spacing at 50°S). The model simulates the uptake and spreading of CFC-12 and SF6, which are atmospheric trace gases that both increased in past decades due to human activities, with CFC-12 leveling off in the mid-90s and SF6 steadily increasing. Two simulations are performed: a hindcast simulation from 1948 to 2010 and a climatological experiment performed under repeated-annual-cycle forcing. The latter is used to correct the hindcast experiment from model spurious trends unrelated to the atmospheric forcing. Simulated CFC-12 and SF6 are here used 1) to assess the simulated water mass ventilation in comparison with observations and 2) to estimate decadal changes in ocean ventilation. Owing to the similar atmospheric increase rates of CFC-12 and SF6, but with a time lag of 14–15 years, a change between historical CFC-12 and modern SF6 tracer ages implies a decadal change in ventilation. Using this approach it was possible to estimate whether changes in upper ocean ventilation occurred in the period between the 1980s and 2000s in different sectors of the Southern Ocean. Preliminary results show that ventilation of Antarctic Intermediate Water and - partially - of Subantarctic Mode Water increased between the 1980s and the 2000s in several sectors of the Southern Ocean. Despite this general pattern, conspicuous regional variability is also found and will here be discussed.