Geophysical Research Abstracts,
Vol. 11, EGU2009-6869, 2009
EGU General Assembly 2009

Multidecadal variability of the meridional overturning circulation in the NCAR CCSM3 model

D. Hofer (1,2), C.C. Raible (1,2), T.F. Stocker (1,2)

(1) Climate and Environmental Physics, University of Bern, Bern, Switzerland (dhofer@climate.unibe.ch), (2) Oeschger Centre for Climate Change Research, University of Bern, Bern, Switzerland

The meridional overturning circulation (MOC) carries in the upper part of the Atlantic Ocean warm water to the north and, at the bottom, cold water to the south. This process leads to a large northward heat transport, and as a consequence has a considerable impact on the climate. Thus, variations in the strength of the MOC affect the climate of the surrounding areas, e.g. the temperature in Western Europe. Low-frequency variability of the MOC could mask or amplify a trend - like the greenhouse-warming signal – in the data. Therefore, a deeper understanding of such variations is needed for a better quantification of their impact on the climate.
Using the latest low-resolution version of the NCAR community climate system model (CCSM, version 3) a 480-yr present-day simulation (PRES) and a 650-yr 1500AD simulation (PAST) were conducted. The mean MOC-index, defined as the maximum of the meridional overturning streamfunction in the North Atlantic below 500 meters, is 16.4 Sverdrup for PRES and 17.3 Sverdrup for PAST, with a standard deviation of 1.1 Sverdrup in both simulations. The indices exhibit low-frequency variability at periods of 40 to 45 years. The amplitude of the oscillation is roughly 1 Sverdrup and it is persistent for the better part of the simulations. Preliminary results show a significant correlation of the MOC-index with deep water formation areas between Greenland and Iceland, with the MOC lagging by 5 to 7 years. The deep water formation rate increases (decreases) due to a positive (negative) salinity anomaly in this region. The origin of the salinity anomaly is not yet clear. The goal of this work is to understand the complete mechanism that leads to the persistent multidecadal oscillation of the MOC and to point out the climatic implications of the oscillation in this model.