Geophysical Research Abstracts
Vol. 13, EGU2011-13494, 2011
EGU General Assembly 2011

multidecadal variability of the atlantic meridional overturning circulation

Xiuhua Zhu
KlimaCampus, Universitaet Hamburg, Germany (xiuhua.zhu@zmaw.de)

The 60-80 year multidecadal variability of the Atlantic Meridional Overturning Circulation (AMOC) in the coupled ECHAM5/MPIOM is presented as an atmosphere-ocean coupled mode by means of the multivariate extended empirical orthogonal function (M-EEOF) analysis. At the AMOC minimum, cooling occurs in the subpolar north Atlantic basin, while warming takes place in the intergyre zone, generating a positive meridional SST gradient anomaly across the North Atlantic current (NAC). The restoring AMOC is accompanied by the southward advection of the North Atlantic deep water (NADW) from the deep subpolar basin. When the relatively cold and fresh NADW crosses the intergyre zone beneath the warm salty North Atlantic current (NAC), through the thermal wind balance, a shear in zonal velocity is generated near the cross-over with positive anomalies (eastward) in the upper layers fostering an anomalous cyclone. This anomalous cyclone enhances the entrainment of cold and fresh subpolar water near the cross-over while directing more warm and salty subtropical water northward and leading to warming in the upper subpolar ocean, thus, the meridional SST gradient across the NAC weakens, which reduces the surface westerlies over the NAC region likely by reducing the eddy activities and the associated poleward westerly momentum transport. At the maximum AMOC, the deep subpolar basin is occupied by relatively warm NADW recently formed, while the deep subtropical basin is filled with the relatively cold NADW evacuated from the subpolar basin; thermal wind anomalies are generated near the cross-over but with opposite signs and the opposite half of the cycle starts.