Geophysical Research Abstracts, Vol. 8, 01139, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01139

Baroclinic variability of the meridional overturning circulation

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An eddy-permitting numerical ocean model is used to investigate the variability of the meridional overturning circulation (MOC). It is found that even on sub-annual timescales there is a substantial variability of the MOC and that a significant fraction of that variability is due to changes of the density field in the upper 1000 m of the ocean. These changes reflect perturbations of the isopycnal structure which travel westward as Rossby waves. Due to a temporally changing phase difference between the eastern and western boundaries the Rossby waves affect the MOC by modifying the basin-wide east-west density gradient. Both the numerical model used in this study as well as calculations based on Rossby-wave theory suggest that this effect can account for an MOC variability of several Sv (1Sv = 10^6 m^3/s). These results could have implications for the interpretation of variability signals inferred from hydrographic sections and might contribute to the understanding of the data obtained from the RAPID monitoring array deployed at 26°N in the North Atlantic.