



Effect of gravity waves on the North Atlantic circulation

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The recently proposed IDEMIX (Internal wave Dissipation, Energy and MIXing) parameterisation for the effect of gravity waves offers the possibility to construct consistent ocean models with a closed energy cycle. This means that the energy available for interior mixing in the ocean is only controlled by external energy input from the atmosphere and the tidal system and by internal exchanges. A central difficulty is the unknown fate of meso-scale eddy energy. In different scenarios for that eddy dissipation, the parameterized internal wave field provides between 2 and 3 TW for interior mixing from the total external energy input of about 4 TW, such that a transfer between 0.3 and 0.4 TW into mean potential energy contributes to drive the large-scale circulation in the model. The impact of the different mixing on the meridional overturning in the North Atlantic is discussed and compared to hydrographic observations. Furthermore, the direct energy exchange of the wave field with the geostrophic flow is parameterized in extended IDEMIX versions and the sensitivity of the North Atlantic circulation by this gravity wave drag is discussed.