Internal-wave driven diapycnal mixing in the ocean: parameterizations and climatic impacts

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Abstract

Important sources of energy for internal waves are winds, leading to the generation of near inertial waves, and the flow of sub- and near-inertial currents and barotropic tides over topography in the stratified ocean, leading to, respectively, the generation of internal lee waves and internal tides. The breaking of internal waves represents the main source of diapycnal mixing in the ocean interior. Diapycnal mixing is in turn a crucial driver of the thermohaline circulation and plays a key role in maintaining ocean stratification and in the transport and storage of heat and carbon dioxide.
However, the breaking of internal waves occurs on scales too small to be resolved explicitly in ocean climate models. Physically based parameterizations of the small-scale mixing induced by internal waves are therefore needed for realistic simulation of the ocean and for estimating how mixing might change in a changing ocean.
In this talk, I will present parameterizations of internal-wave driven mixing for ocean models that have been developed as part of the US Climate Process Team on Internal-Wave Driven Mixing (http://www-pord.ucsd.edu/_~jen/cpt/) and implemented in the NOAA/GFDL's climate model ESM2G. Climate simulations of 1000 years are used to assess the sensitivity of the ocean state to these parameterizations. I will especially focus on the sensitivity of the thermohaline circulation, ocean ventilation, temperature field and of steric sea level to parameterizations of local and remote internal-tide dissipation and of lee-wave driven mixing.

*Speaker