Session: C28 Poster: W44A

Impact of bottom roughness on tidal mixing

Eleftheria Exarchou†;
† Max Planck Institute for Meteorology, Germany
Leading author: eleftheria.exarchou@zmaw.de

We analyze the sensitivity of a tidal mixing scheme on the oceanic bottom roughness using the results from several global ocean model experiments, performed with the Max Planck Institute Ocean Model MPIOM. The tidal mixing scheme produces spatial variations of diapycnal diffusivity depending on the locations of tidal energy dissipation over rough topography. A consideration of roughness at different spatial scales results in different spatial distribution of diffusivity. Physical arguments suggest that tidal mixing occurs over small-scales features of topography, of the order of 1-20 km. In past studies, however, bottom roughness has been calculated at larger scales than that. We perform three simulations including the tidal mixing scheme that use bottom roughness calculated on three different spatial scales: the first on small-scale radius of 15 km, the second on medium-scale radius of 50 km, the third on large-scale radius of 300 km, which corresponds to the model grid. The tidal simulations are compared with two control experiments, which use the standard configuration (Pacanowski and Philader, 1981), one with low and the second one with high, spatially constant background diffusivity. The main result is that the three tidal simulations have different equilibrium solutions. This implies that the implementation of the tidal mixing scheme is not straightforward and that future studies should take into account the implications of the sensitivity on different modeled roughness. We further discuss what drives the changes in the large-scale circulation among the tidal simulations and the control runs. In addition, to assess whether the tidal simulations perform better that the control run, we compare with observations. All tidal simulations reduce the model bias at big depths and they increase the bias at intermediate depths.