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Southern Ocean zonal asymmetries in mixed layer depth variability in the NEMO GCM

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The mixed layer facilitates the conversation between the ocean and atmosphere. It is a crucial feature for biological and chemical processes, and a key feature for ocean models to capture. Here, we investigate the mixed layer depth both in a coarse (1°), an eddy permitting (1/4°) and an eddy-resolving (1/12°) version of the NEMO general circulation model (GCM). We highlight the model's skill, comparing model data with available observational datasets, with focus on the zonal asymmetry in the Southern Ocean. We find that NEMO is largely in agreement with Argo measurements within observational error. We assess the buoyancy forcing in the respective areas, as well as the role of advection. Using the one-dimensional Price-Weller-Pinkel (PWP) model we show that advective processes are key to the initial deepening through setting the autumn stratification. Heat flux is then key to restratification, particular in the deep regions. We also assess the contribution of the Ekman buoyancy flux.