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Langmuir Mixing Effects on Global Climate: WAVEWATCH III in CESM QING LI, Dept. of Earth, Environmental and Planetary Sciences, Brown University, Providence, Rhode Island, USA, ADREAN WEBB, Dept. of Ocean Technology, Policy, and Environment, The University of Tokyo, Kashiwa, Chiba, Japan, BAYLOR FOX-KEMPER, Dept. of Earth, Environmental and Planetary Sciences, Brown University, Providence, Rhode Island, USA, ANTHONY CRAIG, GOKHAN DANABASOGLU, WILLIAM LARGE, MARIANA VERTENSTEIN, National Center for Atmospheric Research, Boulder, Colorado, USA — Large Eddy Simulations (LES) have shown the effects of ocean surface gravity waves in enhancing the ocean boundary layer mixing through Langmuir turbulence. Neglecting this Langmuir mixing process may contribute to the common shallow bias in mixed layer depth in regions of the Southern Ocean and the Northern Atlantic in most state-of-the-art climate models. A third generation wave model, WAVEWATCH III, has been incorporated as a component of the Community Earth System Model, version 1.2 (CESM1.2). In particular, the wave model is now coupled with the ocean model through a modified version of the K-Profile Parameterization (KPP) to approximate the influence of Langmuir mixing. Unlike past studies, the wind-wave misalignment and the effects of Stokes drift penetration depth are considered through empirical scalings based on the rate of mixing in LES. Wave-Ocean only experiments show substantial improvements in the shallow biases of mixed layer depth in the Southern Ocean. Ventilation is enhanced and low concentration biases of pCFC-11 are reduced in the Southern Hemisphere. A majority of the improvements persist in the presence of other climate feedbacks in the fully coupled experiments.

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