

EGU24-12421, updated on 14 Jan 2025
<https://doi.org/10.5194/egusphere-egu24-12421>
EGU General Assembly 2024
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A Novel Process Model of Ocean-Sea-Ice Interaction Using CESM

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We report on the development of a novel process model created to study ocean-sea ice interaction and the dynamics of the upper ocean in the marginal ice zone (MIZ), built using the Community Earth System Model (CESM). Our model uses the MOM6 ocean model and CICE6 sea-ice model as active components within CESM, on a custom ~50km x ~50km grid with a horizontal resolution of ~50m, extending to a depth of 75m (30 vertical layers). The model allows for either reflecting or zonally re-entrant boundary configurations. Atmospheric forcing is imposed through a simplified data atmosphere component that provides constant forcing over the model domain. Results from several simple scenarios are presented and compared to results obtained using the MITgcm.

By working within CESM, we are able to leverage CESM's existing infrastructure and capabilities, including the use of the Community Mediator for Earth Prediction Systems (CMEPS) for coupling between active components. Furthermore, additional model components that are already available within CESM (e.g., waves, atmosphere) can be incorporated into the process model in a straightforward way. Future work will include incorporation of a modified sea-ice component that allows tracking of individual floes utilizing a discrete element method approach.