

2023 PAMIP Webinar Series

The atmospheric response to Arctic sea ice loss in a hierarchy of GCMs

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Abstract

We develop a hierarchy of ocean models used in coupled general circulation models to study the atmospheric response to Arctic sea ice loss. The ocean model hierarchy has four members: a slab ocean model, a mixed-layer model (MLM) with entrainment and detrainment, an Ekman MLM, and an ocean general circulation model. We find that atmospheric response depends critically on upper ocean processes. For example, the mixed-layer entrainment enhances the heat uptake that influences the shift in the westerly jet and the Intertropical Convergence Zone (ITCZ). Moreover, the shift of ITCZ is sensitive to the form of Ekman flow parameterization that includes the effect of wind-driven frictional flow. Lastly, the response of Atlantic Meridional Overturning Circulation in the fully-coupled model can overwhelm the previously mentioned process, demanding better-simulated AMOCs in future climate models.



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