PAMIP Webinar Series

Weak and Non-robust Eurasian Cooling Response to Arctic Sea Ice Loss in Climate Models

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Abstract

Cold winters over Eurasia are often coincident with warm winters in the Arctic, often referred to as the "Warm Arctic-Cold Eurasia" pattern. The extent to which this observed correlation is indicative of a causal response to sea-ice loss is debated. In this study, by using large multi-model ensemble of coordinated experiments, we find that the Eurasian temperature to Arctic sea-ice loss is weak and non-robust across different climate models. Linear regression analysis shows that the cooling driven by tropospheric and stratospheric dynamics is largely canceled by tropospheric thermodynamic warming, which is the warming induced by sea ice reduction that spreads into the midlatitudes by eddy diffusion. The contributions from both tropospheric dynamics and thermodynamics show substantial spread across models which does not cancel, resulting in large inter-model spread of Eurasian temperature response. Apart from internal variability, there are detectable differences due to model physics that contributes to the inter-model spread.