

2025 PAMIP Webinar Series – April 24th at 3:00 pm (GMT)

Arctic sea ice–air interactions weaken El Niño–Southern Oscillation

Professor Aiguo Dai

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Time: 3:00 pm (GMT)

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Abstract

El Niño–Southern Oscillation (ENSO) over the tropical Pacific can affect Arctic climate, but whether it can be influenced by the Arctic is unclear. Using model simulations, we show that Arctic sea ice–air interactions weaken ENSO by about 12 to 17%. The northern North Pacific Ocean warms due to increased absorption of solar radiation under such interactions. The warming excites an anomalous tropospheric Rossby wave propagating equatorward into the tropical Pacific to strengthen cross-equator winds and deepen the thermocline. These mean changes dampen ENSO amplitude via weakened thermocline and zonal advective feedbacks. Observed historical changes from 1921–1960 (with strong sea ice–air interactions) to 1971–2000 (with weak interactions) are qualitatively consistent with the model results. Our findings suggest that Arctic sea ice–air interactions affect both the mean state and variability in the tropical Pacific, and imply increased ENSO amplitude as Arctic sea ice and its interactions with the atmosphere diminish under anthropogenic warming.



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