PAMIP Webinar Series

Arctic sea-ice loss drives more frequent strong El Niño events

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Abstract

Arctic sea ice has declined substantially and is projected to reach a seasonally ice-free state in the coming decades. Little is known about whether decreasing Arctic sea ice is capable of influencing the occurrence of strong El Niño events, a prominent mode of climate variability with global impacts. Based on time slice coupled model experiments, we show that no significant change in the occurrence of strong El Niño is found in response to moderate Arctic sea-ice loss that is consistent with satellite observations to date. However, as the ice loss continues and the Arctic becomes seasonally ice-free, the frequency of strong El Niño events increases by more than one third, as defined by gradient-based indices that remove mean tropical Pacific warming induced by the seasonally ice-free Arctic. By comparing our time slice experiments with greenhouse warming experiments, we conclude that about 37-48% of the increase of strong El Niño near the end of the 21st century is associated specifically with Arctic sea-ice loss. Further separation of Arctic sea-ice loss and greenhouse gas forcing only experiments implies that the seasonally ice-free Arctic might play a key role in driving significantly more frequent strong El Niño events.