

Influence and mechanism of the tropical Pacific variability on the Arctic and its seasonality

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Arctic temperature has increased about twice as fast as global mean surface temperature in recent decades. While anthropogenic influence on this Arctic warming is evident, potential contributions from internal climate variability remains to be examined. Svendsen et al. (2018) showed that Pacific decadal variability played a key role in the early twentieth century Arctic warming through a coupled model pacemaker experiments with historical forcing. It is still unclear, however, how much influence the Pacific internal variability induces on the Arctic and how this remote influence is conveyed.

This study investigates the relationship between Arctic climate and tropical Pacific variability (TPV) by using a pre-industrial control experiment with GFDL CM2.1, with the primary aim to quantify the effect of TPV in different timescales. The result shows that the surface temperature response at high latitudes is amplified at multi-decadal timescales compared to sub-decadal one. The Arctic temperature anomalies peak near surface and diminishes with height. Moreover, Arctic temperature and sea ice responses feature strong seasonality with peak in late winter, despite weak seasonality of the tropical SST anomalies associated with decadal TPV. These features bear similarity to radiatively induced Arctic warming, and suggest importance of local feedbacks in Arctic climate variability driven remotely by the TPV.

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