



## **A New Paradigm for Decadalscale Midlatitude AirSea Interaction**

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Ocean-atmosphere interactions play a key role in climate variability on a wide range of time scales from seasonal to decadal and longer. The extratropical oceans are thought to be primarily forced by the atmosphere on seasonal to interannual time scale, but also to exert noticeable feedbacks on the latter especially on decadal time scale. Yet the largescale atmospheric response to anomalous extratropical sea surface temperature (SST) is still under debate. Here we study the response of the atmosphere to SST anomalies associated with the Pacific Decadal Oscillation (PDO), the most energetic mode of decadal North Pacific SST variability, by means of dedicated high resolution atmosphere model experiments. One of the new major findings is that the atmospheric eddies, which are key to establish a statistically large scale response, can be energized by the anomalous SST over the eastern part of the North Pacific basin and not necessarily over the SST front region in the west. Moreover, daily SST variability needs to be resolved to obtain a response that is consistent with observations. Finally, the response is state-dependent and varies from decade to decade. The results have far reaching implications for climate modelling and prediction, as the role of the extratropical oceans in climate variability and predictability may have been underestimated.