



## **Atmospheric bridge on orbital time scales**

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Large-scale atmospheric patterns are examined on orbital timescales using a climate model which explicitly resolves the atmosphere - ocean - sea ice dynamics. It is shown that in contrast to boreal summer where the climate mainly follows the local radiative forcing, the boreal winter climate is strongly determined by modulation of circulation modes linked to the Arctic Oscillation/North Atlantic Oscillation and the El Nino Southern Oscillation. We find that during a positive phase of the Arctic Oscillation/North Atlantic Oscillation the convection in the tropical Pacific is below normal (La Nina conditions). El Nino conditions go along with high insolation induced by the precessional cycle, and the positive phase of the Pacific/North American teleconnection. The related atmospheric circulation provides an atmospheric bridge for the precessional forcing which is strongest in the tropics to high latitudes, and induces a non-uniform temperature anomalies with large amplitudes over the North American continent. We argue that this is important for the mechanisms responsible for the understanding of climate variability on (multi-)millennial time scales.