



Remote control of North Atlantic Oscillation predictability via the stratosphere

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The phase and amplitude of the North Atlantic Oscillation (NAO) are influenced by numerous factors, including sea-surface temperature (SST) anomalies in both the Tropics and extratropics and stratospheric extreme events like stratospheric sudden warmings (SSWs). Analyzing seasonal forecast experiments, which cover the winters from 1979/1980-2013/2014, with the European Centre for Medium-Range Weather Forecast model, we investigate how these factors affect NAO variability and predictability. Building on the idea that tropical influence might happen via the stratosphere, special emphasis is placed on the role of major SSWs. Relaxation experiments are performed, where different regions of the atmosphere are relaxed towards ERA-Interim to obtain perfect forecasts in those regions. By comparing experiments with relaxation in the tropical atmosphere, performed with an atmosphere-only model on the one hand and a coupled atmosphere-ocean model version on the other, the importance of extratropical atmosphere-ocean interaction is addressed.

Our results suggest that a perfect forecast of the tropical atmosphere and allowing two-way atmosphere-ocean coupling in the extratropics seem to be key ingredients for successful SSW predictions. In combination with SSW occurrence, a clear shift of the predicted NAO towards lower values occurs.