

# **Atmospheric circulation response to anomalous Siberian forcing in autumn 2016 and its long-range predictability.**

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The warm Arctic - cold continent pattern has recently attracted scientific attention and has been associated with a negative North Atlantic Oscillation (NAO) in winter. The pattern was of record strength in October 2016, providing the opportunity to test its influence on atmospheric circulation. We show that there was an unusually weak polar stratospheric vortex and a weakly negative NAO in November – early December 2016, and link it to increased planetary wave generation and upward propagation due to cold anomalies over Siberia. This response ended earlier in the season than in years with similar forcing before, likely due to internal variability. Long-range forecasts initialized in early October reproduced both weak polar vortex and negative NAO in November to early-December; however the negative NAO lasted for too long in the forecasts. The effects of cold anomalies in Siberia were supported by weaker effects of sea ice decline in the Barents, Kara and Greenland (BKG) seas. Considering the period from 1979 to 2016, autumns when warm BKG seas coincided with cold Siberia (2000, 2016) had strong wave flux from the troposphere to stratosphere, but this was not the case for autumns with warm BKG seas without a cold Siberia (2007, 2010, 2011, 2012). Our results support stratospheric pathway for atmospheric circulation forcing by Siberian surface anomalies and uncover a source of skill for long-range forecasts in autumn.

Key words: Siberian Snow, Arctic Sea Ice, Polar Vortex, NAO, Seasonal Forecast