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Ural blocking linking the extremes of Arctic sea-ice loss, cold Eurasia and weak stratospheric vortex in autumn 2016

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In this study we investigate the dynamical environment that led to the repeated cold surges over central Asia, exceptionally warm conditions and sea ice deficit over the Arctic, as well as the significant weakening of the stratospheric polar vortex in autumn 2016. To this aim we use ERA-Interim reanalysis data and COBE sea ice and SST observational data with view to trace the pathways that led to these extreme conditions. Abundant high-latitude blocking activity over Eurasia was observed during autumn 2016. Specifically, blocking occurrence over the Ural sector was nearly four times higher than the climatological levels. Blocking events drove intense upward propagation of wave activity that resulted in episodes of stratospheric polar vortex weakening. Lower than normal sea ice cover was observed in early autumn over the Arctic, in particular over the East Siberia Sea. Several successive Ural blocking events had a significant contribution to the unprecedented sea ice deficit observed in late autumn 2016 over the Barents-Kara Seas. Each blocking event induced circulation anomalies that resulted in cold air advection to the south and warm air advection to the north of the blocking ridge. Moreover, the warming anomalies over the Arctic and cooling anomalies over central Asia featured large concurrent variability on synoptic timescales whose pace was controlled by blocking activity. The sea ice cover minimum over the Barents-Kara Seas for the year 2016 was actually recorded in mid-November and December, following two strong Ural blocking episodes. Thus, Ural blocking had a key role in linking the significant circulation anomalies observed both in the Atmosphere and Arctic Cryosphere in autumn 2016.