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Subseasonal Variability of Sea Level Pressure and Its Influence on Snowpack over Mid-High-Latitude Eurasia during Boreal Winter

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The atmospheric circulation significantly influences the snowpack over mid-high-latitude Eurasia. This study examines the characteristics of the leading subseasonal variability mode of boreal winter sea level pressure (SLP) and its influence on snowpack over mid-high-latitude Eurasia, using the fifth generation of European Center for Medium-Range Weather Forecasts (ECMWF) reanalysis (ERA5) data and different snowpack datasets. The leading mode, characterized by a monopole pattern with a strong surface anomalous high centered near the Ural Mountains, exhibits a barotropic structure and extends from the surface to the tropopause. Above SLP and geopotential height anomalies propagate southeastward from the Barents-Kara Sea to East Asia. This leading SLP mode contributes to surface air temperature (SAT) and snowfall circulation anomalies over mid-high-latitude Eurasia. The latter two both directly influence on snowpack anomalies in situ. Over high latitude region, snowfall circulation anomaly is the dominant factor to control the snow depth anomaly. Over middle latitude region, both SAT and snowfall circulation anomalies lead to the snowpack anomaly. Furthermore, the response of snow depth to the leading subseaonal SLP mode occurs 2-5 days earlier than the response of snow cover to the same mode. In addition, it is suggested that the Arctic Oscillation (AO), East Atlantic/West Russia (EAWR) and Polar/Eurasia (PEU) pattern may contribute to the development of the leading SLP mode and subsequently influence snowpack anomalies.