



Synoptic Aspects of Predictability of the Wintertime Arctic Oscillation

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The wintertime Arctic Oscillation dominates the northern extratropical climate system. Reliable prediction of the wintertime Arctic Oscillation (AO) well in advance, a 1-month lead at least, is one of the priorities for extratropical seasonal forecasting. A statistical method of the 1-month lead prediction of the wintertime Arctic Oscillation index (AOI) has been developed. Independent verification assessments based on a series of 30 forecasts of the DJF AOI reveal its high skill, with correlations between the predicted and observed DJF AOI exceeding 0.6 and mean squared error skill scores exceeding 0.35.

Synoptic aspects of predictability underlying this method are discussed. Predictors, independently constructed for each forecast based on October geopotential heights of the 500 hPa surface, indicate that the strongest impact of October circulation on the wintertime AO originates from a circulation anomaly over the Taymyr Peninsula. Winters of the positive (negative) AO polarity tend to be preceded by an October cyclonic (anticyclonic) Taymyr circulation anomaly (TCA) associated with an advection of the cold (warm) air to the central Arctic leading to enhancement (weakening) of the circumpolar vortex, and advection of the warm (cold) air to the East Asia with corresponding weakening (enhancement) of the East Asia trough associated with the planetary wave-1 and wave-2. The TCA sign reflects prevailing routes of propagation of cyclones in October. It synoptically explains a tendency of sea level pressure anomalies in the Siberian high region to change the sign from October to December. It is shown that surface predictors of the wintertime AOI discussed in the literature, particularly October anomalies of Siberian snow cover extent and advance, the East Arctic sea ice concentration and surface temperature are closely related the TCA.