

Influence of summertime Arctic sea-ice anomalies on wintertime coldness over Japan

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Influence of sea-ice extent anomalies within the Arctic sea during warm seasons on the following wintertime surface climate variables over and around Japan. In the winter for 2005/06, severe cold conditions and heavy snow fall were observed in many regions over Japan, especially in December, 2005. In contrast, wintertime total accumulation of sea-ice extent within the Sea of Okhotsk for the 2005/06 season was minimum in the last 36 winters. Further, in the preceding summer, the minimum record for the sea-ice extent within the Arctic Sea was broken in September, 2005. In this study, we focus on the summertime sea-ice extent anomalies as one of possible factors for wintertime coldness over Japan.

Observational evidence shows significant statistical relationship between the winter time average surface air temperature over Japan and the preceding summertime sea-ice extent anomalies in the Barents-Kara seas (BK). Actually, atmospheric fields for December linearly regressed on the time series of the BK sea-ice extent in October are characterized as significant cold anomalies from the Central Asia to Far East including the whole Japan and significantly strong Siberian high and Aleutian low associated with small ice condition in the BK seas, which essentially reflects the conditions for the 2005/06 winter.

Results from numerical experiments using an atmospheric general circulation model generally support this notion. Significant differences in the model responses between the light and heavy ice cover over the BK seas are also identified in the surface air temperature field from the Central Asia to Far East and in the intensity of the Siberian high. The model results suggest the possible influence of the summertime Arctic sea-ice on the wintertime coldness over Japan. Further investigation should be required for dynamic and thermodynamic characteristics of atmospheric response which explains the lagged influence of the Arctic sea-ice anomalies.