Primary factors of cold winter 2012/2013 in East Asia

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Northern East Asia, especially from eastern Mongolia to northeastern China, experienced cold winter 2012/2013, having been previously affected by cold conditions in winter 2011/2012. Most parts of Japan (except its southwestern part) also experienced cold winter. In northern Japan, frequent cold surges caused heavy snowfall, and some observation stations set record-breaking annual maximum snow depth (e.g., a station recorded 566 cm). Atmospheric circulation during this winter featured annular patterns with positive anomalies over the Arctic region and negative anomalies over the mid-latitudes in the troposphere as well as the stratosphere, exhibiting negative Arctic Oscillation (AO) like conditions. In the 500-hPa height field, blocking highs were frequently observed around eastern Siberia, and split polar vortices moved toward northern East Asia. TCC performed experiments using an AGCM (JMA's one-month prediction model) forced with real and climatological sea surface temperature (SST) and sea ice. The results suggested that warm SSTs and less-than-normal sea ice extent in the Arctic region may have contributed to negative AO-like anomaly patterns. The AO-like patters may have been associated with troposphere-stratosphere interaction. Possible primary factors contributing to the cold conditions are summarized in Figure 1.

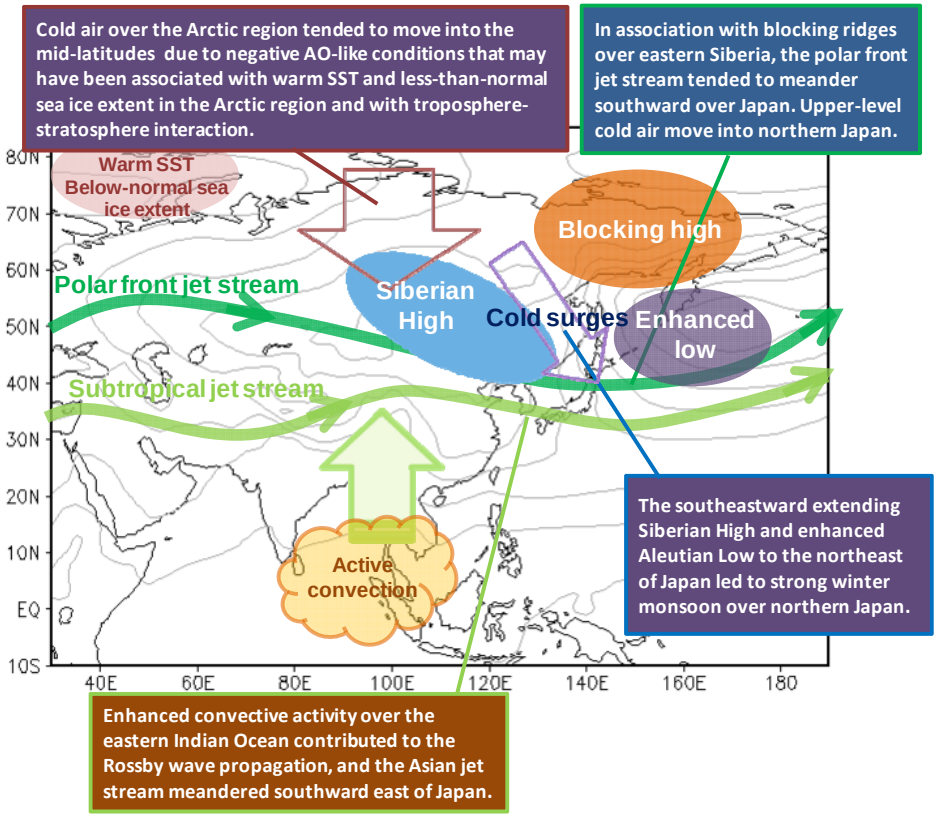

Figure 1 Primary factors contributing to cold winter 2012/2013 in East Asia.