The 1980's Abrupt Climate Change in East Asia

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Abstract

An abrupt change in East Asian climate occurred in late 1980's(e.g., Hare and Mantua 2000). This climate regime shift, which was observed mainly in the northern high latitudes, was characterized by the temperature increase in mid-latitude and decrease in polar region accompanied by the decrease in sea level pressure in polar region.

The sequential t-test analysis of regime shifts (STARS) proposed by Rodionov (2004) was used in my previous study to detect the abrupt climate change in East Asia during 1950's. The same technique also detected a change point in 1987. After 1987, temperature in most regions of East Asia increase abruptly almost all year round but with the largest amplitude in winter. There was a warming in troposphere and a cooling in stratosphere. The corresponding sea level pressure and height fields in the troposphere dropped significantly in the high-latitude part of Eurasian continent. The snow cover in the high latitudes also decreased abruptly after 1987.

It was found that the Arctic Oscillation index also changed phase from negative to positive in late 1980's. This phase change indicates a strengthening polar vortex and westerly wind in high latitude, which bring the warmer air from the Atlantic farther eastward into the Eurasian continent. A strengthened polar vortex also means less stationary wave activity and less southward penetration of polar cold air. These are likely the factors leading to the East Asia warming after 1987. However, what mechanism caused the phase change in the Arctic Oscillation is still unknown.

References

Rodionov, S. N., 2004: A sequential algorithm for testing climate regime shifts, *Geophys. Res. Lett.*, **31**, L09204, doi:10.1029/2004GL019448.

Hare S.R., and N.J. Mantua, 2000: Empirical evidence for North Pacific regime shifts in 1977 and 1989. *Progr. Oceanog.*, **47**, 103-146.