

INFLUENCE OF THE POLAR AIR MASS ON THE WEATHER IN NORTHERN JAPAN (ABSTRACT)

Kunio RIKIISHI, Ryota AOKI and Shingo MIYAHATA

Department of Earth Sciences, Hirosaki University, Bunkyo-cho 3, Hirosaki 036

The unequal heating and cooling of the atmosphere in the polar regions and tropics is the most fundamental control of both weather and climate (G.T. TREWARTHA and L.H. HORN; *An Introduction to Climate*. New York McGraw-Hill, 416, 1980). Although unusual weather in Japan shows some connection with such tropical phenomena as convective activity in the southwestern Pacific and El Nino–Southern Oscillation, unusual weather in northern Japan is not well correlated with oceanic and atmospheric conditions in the tropics. This may suggest that the Arctic is likely to be responsible for the unusual weather in northern Japan. In this report we have studied how the Arctic is related to unusual weather in northern Japan such as the Yamase circulation (chilly northeasterly wind in the summertime) and the heavy snowfall along the western coast in northern Japan. Data analyzed here are 5-day averages of the surface temperature at Hachinohe (a good indicator of the Yamase circulation), the snowfall rate at Aomori, and the upper air observations objectively analyzed by National Meteorological Center of the United States for the years 1960–1988.

It has been found that the Yamase circulation is observed when the general circulation at the 500 hPa level shows wave number 3 circulation with troughs over the West Siberian Plain, Bering Strait and Canadian Northwest Territories, being associated with the bifurcation of the jet stream. At this time, the Arctic air mass goes through the Bering Strait toward the Sea of Okhotsk and the Japan Sea, causing a very cold summer in northern Japan. It is suggested that the southward extension of the trough over the West Siberian Plain triggers the bifurcation of the jet stream and, eventually, the Yamase circulation.

In the wintertime, on the other hand, it is found that heavy snowfall in northern Japan is observed when the polar vortex shifts from the Canadian Arctic Ocean toward the Central Siberian Plain or the Far East Region. At this time the cold air mass develops to the west of the Sea of Okhotsk and the Aleutian Low develops near the Kamchatka Peninsula. Accordingly, the east-west pressure gradient becomes extraordinary large over the Japan Sea, and the strong winter monsoon blows to cause heavy snowfall along the coastal plains on the Japan Sea side.

(Received December 1, 1993)