Decreasing soil-frost depth and its relation to climate change in Tokachi, Hokkaido

Tomoyoshi Hirota[1]

[1] NARCH

This study analyzes a unique regional database of 20-year records from 1986-2006 of soil frost combined with long-term climate data from 1955-2006. Annual maximum frost depths (Dmax) in the Township of Memuro in Tokachi, Hokkaido have decreased significantly in the last 20 years. The decrease in Dmax was caused by the development of thick snow cover in early winter that insulates the ground, not by the increase in air temperature. The Dmax is strongly correlated with a soil freezing index (F20) that integrates the combined effects of air temperature and snow cover.

Using F20 as a surrogate of Dmax, it was shown that the decreasing frost depth was a regional phenomenon occurring over the Tokachi Plain covering an area of several thousand square kilometers. The timing of a major decrease in F20 in the late 1980's coincided with sharp decreases of snowfall in the Hokuriku region of Japan and the amount of drift ice in the southern part of the Sea of Okhotsk, both of which are regarded as indicators of the strength of the East Asian winter monsoon activities. It will be discussed in 2005-06 year about these phenomenons.