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Rain producing cyclone activity water vapor transport in Mongolia during summer

K. Kimura (1), S. Taniguchi (2), and M. Shinoda (3)

(1) Information Science and Technology,Hokkaido University, Sapporo, Japan (kimura@ssi.ist.hokudai.ac.jp, 81 11 7067690), (2) Japan Airlines International Co., Ltd., Japan, (3) Arid Land Research Center, Tottori University, Tottori, Japan

Meteorological disasters such as flood and drought in middle to high latitudes often occurred in relation to extreme extratropical cyclone activity, leading to a serious damage on the regional society and economy. Given this background, this study investigated the tracks of rain-producing cyclones and the water vapor transport to the systems in Mongolia during 1993 to 2002.

The daily-based synoptic analysis of objective reanalysis data identified two types of the tracks, which are located north (N-track type) and south (S-track type) of the mountainous area of western Mongolia The N- and S-track types comprised 36% and 64% of the entire rain-producing cyclones in Mongolia, respectively. Moreover, the analysis of water vapor flux also revealed two directions (from the north and south) of water vapor transport to the cyclones. The two types of vapor transport from the north and south comprised 52% and 46% of the entire rain-producing cyclones in Mongolia, respectively. The dynamics of the rain-producing systems were considered in terms of the migration of upper tropospheric trough and the existence of cut-off low.

The combination of the location of the tracks (two types) and the directions of water vapor transport (two types) enabled us to classify the synoptic features of the cyclones into typical four types along with exceptional samples. The S-track type with the southward vapor source has been found to cause major heavy rainfall events in this area. The crucial role of the southward vapor source in exciting the cyclone activity was, for the first time, pointed out by the present daily-based analysis, although the previous monthly-based analysis failed to detect the vapor source on a monthly averaged field.