

The Impact of the Radiosonde Observations of Cold Surge over the Philippine Sea on the Analysis of the Tropical Cyclones

Miki Hattori (1), Akira Yamazaki (2), Shin-Ya Ogino (3), Peiming Wu (3), Jun Matsumoto (3,4)

(1) Research and Development Center for Global Change, JAMSTEC, Yokosuka, Japan, (2) Application Laboratory, JAMSTEC, Yokohama, Japan, (3) Department of Coupled Ocean-Atmosphere-Land Processes Research, JAMSTEC, Yokosuka, Japan, (4) Tokyo Metropolitan University, Hachioji, Japan

An East Asian northerly cold surge greatly affects convective activity in the tropics not only in the northern hemisphere but also in the southern hemisphere. In this study, the impact of the radiosonde observations of cold surge over the Philippine Sea on the tropical region and the Southern Hemisphere has been investigated by the assimilation of radiosonde data obtained during the R/V Hakuho Maru cruise KH-12-6 in late December 2012.

After assimilating the observation data, cyclonic rotations around the 4 developing tropical cyclones in the Northern and Southern Hemispheres were more intensified. The analysis errors over the Indian Ocean and the Pacific Ocean in the Northern and Southern Hemispheres were reduced by 1 to 10%.

Our OSE suggests that the tropical cyclones in the southern hemisphere originated from the MJO convection are affected by the cold surge from the northern hemisphere. The impacts of the additional radiosonde observations in the cold surge immediately propagated up to the updraft region near the equator and to the mid-latitude downdraft regions through the local Hadley circulation. After the impact spread in the lower troposphere, large impacts were deepened around the tropical cyclones and depressions within 2 days.

It is supposed that the large impact immediately expands in the lower troposphere between 40°N-40°S because the observations of the cold surge directly affects the upward motion and the subsidence of the local Hadley circulation. The impact on the tropical cyclones and depressions appeared after the sufficient spread of the impacts through the local Hadley circulation. The present study revealed that the strength of the cold surge by the observation over the Philippine Sea has impacts on the tropical cyclones, even in the southern mid-latitudes.