Geophysical Research Abstracts
Vol. 17, EGU2015-4242, 2015
EGU General Assembly 2015

Observations of Typhoon Center by Using Satellite-derived Normalized Difference Convection Index

Chung-Chih Liu (1) and Chun-Hsu Chen (2)

(1) Minghsin University of Science and Technology, The Teaching Center of Natural Science, Taiwan(ccliu@must.edu.tw),
(2) Minghsin University of Science and Technology, The Teaching Center of Natural Science, Taiwan
(addname7224@yahoo.com.tw)

A technique involving differencing water vapor and infrared window channel brightness temperature values to identify and quantify intense convection in tropical cyclones using bispectral geostationary satellite imagery was proposed by Olander and Velden (2009). Rouse et al. (1974) calculated a normalized ratio of the near infrared and red bands and proposed an index called the normalized difference vegetation index. It was then used in many fields such as estimations of vegetation biomass, leaf area, the proportion of absorbed photosynthetically active radiation, etc.

The present study used the spectral features of the IR1 and WV channels of the satellite to define a new index, the brightness temperature of the infrared window channel minus the brightness temperature of the water vapor channel divided by the brightness temperature of the infrared window channel plus the brightness temperature of the water vapor channel. The values obtained by this formula are called the Normalized Difference Convection Index (NDCI) values. The NDCI value is between -1 and 1. The NDCI value at WV = 0K is the highest, 1; while that at IR1 = 0K is the lowest, -1. In cases of a clear sky or atmosphere with thin cloud and dry air, NDCI values should be larger than 0. In cases of a convective cloud system, NDCI values should be lower than 0. In addition, the newly defined NDCI does show significant difference from simple difference of IR1-WV. For example, the NDCI value is -0.0017 at IR1=299K and WV=300K, while the NDCI value is -0.0033 at IR1=149K and WV=150K. The two times difference of NDCI values shows the features of clouds with NDCI value -0.0017 are quite different from those with NDCI value -0.0033. The former may be low level clouds, but the latter may be deep convections. However, the simple difference of IR1-WV cannot be used to distinguish the difference.

The NDCI was applied to determine the centers of Typhoon Longwang (2005). The results showed that the two-dimensional NDCI analysis helped to identify positions of overshooting areas. In addition, because the NDCI values near a typhoon eye were rather significant, if a typhoon eye was formed, the NDCI cross-section analysis could help to confirm its position. When the center of a typhoon was covered by the high Anvils and Cirrus Layers, it could still be found qualitatively through the two-dimensional analysis.

Keywords:Typhoon, Satellite imagery, Normalized Difference Convection Index