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Detection and Analysis of Deep Convective Clouds Using infrared and microwave Satellite Data

J. Liu, J. Bai, Y. Zhu, Z. Cheng, and L. Liu
Beijing Institute of Aviation Meteorology, Beijing, China (cheng9978@126.com)

The detection and analysis on deep convective clouds during 18-19 June 2004 using AMSU-B and GOES-9 satellite data are explored, the methods include water vapor channel microwave brightness differences identification based on the AMSU-B data and the classification of cumulonimbus clouds correlating with deep convective clouds with GOES-9 infrared/water vapor spectral features. The results are validated by matching surface conventional observation reports and synoptic concept model. By comparing the variations of deep convective clouds during different development processes, the characteristics of microwave remote sensing and optical remote sensing are investigated. The results show that the detection areas of multispectral step-wise classification are consistent with those of three water vapor channels microwave brightness temperature differences in the low and mid latitude regions, while the microwave frequencies have the abilities of penetrate the clouds and the identification regions of deep convective clouds based on AMSU-B are small than those of optical remote sensing which only gets information from cloud top and the cirrus clouds are mistaken to deep convective clouds. In high latitude regions the identification from three microwave channels discriminate deep convective clouds more effectively than those of optical method, because the brightness temperature differences between three microwave channels are affected by surface features less, while the brightness temperature of infrared and water vapor channels are very low and it is hard to discriminate deep convective clouds from other clouds and surfaces. GOES-9 has obvious advantages in monitoring development and evolution of deep convective clouds in real-time and successively. The surface reports are coincident with detection results of microwave and optical remote sensing, in particular, the distributions of thunderstorm and the identification of AMSU-B are obviously consistent. The deep convective clouds over sea are coincident with frontal cyclone and typhoon synoptic concept models.