Detection of Cloud-Base Height Using Cloud Radar and Microwave Radiometer

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Abstract

Three cloud type studies of cloud-base height(CBH) detecting from cloud radar and microwave radiometer have been analyzed. The studies were performed during the period from June to August 2012-2014 at Xianning in China. During the period of measurement, cloud radar provided vertical pointing detecting of reflectivity factor. The bottom of cloud boundary from reflectivity factor was considered as CBH. While microwave radiometer installed with infrared radiation thermometer offered cloud base brightness temperature. Then CBH was got after retrieval.

In this paper CBH of three types clouds were detecting and difference between two instruments were analyzed. The cloud type selected covered thin low clouds (fractocumulus, Cu hum), weak convective cloud and strong convective cloud. The results of the comparison can be summarized as follows:(Ⅰ)The results show the values of CBH from two instruments match well in thin low clouds condition . the correlation coefficient between the two CBHs was 0.87 (Ⅱ)CBH results in a correlation coefficient ranging from 0.5 to 0.7 which depends on the convective center height away from the ground. The convective center height is higher, the correlation coefficient is greater. Two cases were considered in weak convective cloud, such as convective center below 3km and convective center above 3km.When convective center was below 3km but long time lasting, CBH from two instruments don’t match well, with a correlation coefficient of 0.51.Another,when convective center was much above 3km but short time lasting, CBHs match better than the former, with a correlation coefficient of 0.68.No rainfalls in the two cases. (Ⅲ)For strong convective cloud, it often rain in this condition. CBH from cloud radar is much lower than that from microwave radiometer. No correlation coefficient was given.

Two instruments with different detecting principle reveal difference for the same cloud body according to the weather condition. Both instruments were influenced by rainfall during working. Also CBHs from cloud radar were usually lower than that from microwave radiometer. Cloud radar with millimeter-wavelength was more sensitive to detecting moisture. Further studies are needed to confirm CBH in order to depict the cloud boundary by the two ground-based cloud detecting instruments.