7.8 STRUCTURAL CHARACTERISTICS OF PRECIPITATING CLOUDS MEASURED BY TRMM PR AND IGRA

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The temperature and humidity structure of precipitating cloud can be obtained by combining detections of ground-based radar or space-based radar with the re-analysis data, but this structure is different from the real one. The structure in a limited area can also be obtained through measurements by instruments onboard aircraft, but such flight has some dangerous and costly. To reveal the nature of the vertical structure of temperature and humidity inside precipitating clouds, a quasi-spatiotemporal synchronization dataset of temperature and humidity profiles collocated with precipitation profiles is generated in this study by merging the Integrated Global Radiosonde Archive (IGRA) and Tropical Rainfall Measuring Mission (TRMM) Precipitation Radar (PR) from 1998 to 2012. Based on this data, the vertical characteristics of precipitation, temperature, humidity and convective available potential energy (CAPE) in East Asian Summer Monsoon (EASM) region and Indian Summer Monsoon (ISM) region are investigated.

Results indicate that the height of storm tops can reach 17 km and 12 km for convective and stratiform precipitation, respectively, in EASM region. Usually, the height of storm tops in the ISM is 1 km lower than that in EASM region. The significant difference of temperature for the precipitation scenario between EASM region and ISM region appears near the surface, i.e. about 4C higher in ISM region than in EASM region. Generally, relative dryer air occurs inside convective precipitating clouds in ISM region, and there is a larger CAPE precipitation scenario in ISM region than in EASM region. In EASM region, the results show that the height of storm tops for convective precipitation are higher than that for stratiform precipitation, which causes by more unstable atmospheric movements in convective precipitation. The height of storm tops is higher at 1200 UTC (evening at local time) than at 0000 UTC (morning at local time) over land for both convective and stratiform precipitation, and vice versa over ocean. Additionally, temperature anomaly patterns inside convective and stratiform precipitating clouds show a negative anomaly of about 2 K, which results in cooling effects in the lower troposphere. This cooling is more obvious at 1200 UTC for stratiform precipitation. The positive anomaly that appears in the middle troposphere is more than 2 K, with the strongest warming at 300 hPa. Relative humidity anomaly patterns show a positive anomaly in the middle troposphere (700500 hPa) prior to the two types of precipitation, and the increase in moisture is evident for stratiform precipitation.