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Characteristics of Cloud Vertical Structure over the Tibetan Plateau and its Neighboring Areas

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By using CloudSat/CALIPSO and TRMM data, the characteristics of cloud vertical structure over the Tibetan Plateau, its southern adjacent land (referred as southern region) and the tropical region are comparatively analyzed. The cloud vertical structure over the Tibetan Plateau and its southern region shows significant seasonal variation. In the Tibetan Plateau, the cloud amount presents a single peak (located in 7-11 km) in January-April, while two peaks (located in 5-7 km and 11-17km separately) after mid-June, and resumes one peak (located in 5-8 km) after mid-August. In the southern region, the cloud occurs rarely from October to April, and the cloud amount is mostly below 4% ; while from May to September, the cloud are in between 10-17.5 km and the amount are more than 44%, which is the largest among the three regions. In the tropical region, the cloud is located stably between 10-17.5 km and the amount is 12% -44% through whole year. Due to the Tibetan Plateau restrictions on moisture supply in lower level, there is a significant compression of cloud thickness, cloud layers, as well as cloud top height, so the possible precipitation intensity is smaller over the Tibetan Plateau than the other two regions. The variation range of cloud thickness, cloud layers number and cloud top height corresponding to different precipitation intensity is significantly smaller over the Tibetan Plateau than the other two regions. In summer, deep convection cloud, which can reach 12-16 km altitude, is significantly smaller over the Tibetan Plateau than the other two regions, while the relatively shallow cloud, located in 5-8 km and corresponding to mixed phase cloud water content, appears much more than the other two regions. These significant differences of cloud microphysical characteristics over the Tibetan Plateau and other regions may have impacts on the radiation characteristics of clouds and precipitation. Our results can be applied on the improvements of model simulation on the cloud vertical structure, microphysical characteristics and precipitation.