Cloud macro physical characteristics in Beijing based on Ka-radar data during 2014-2017

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In this paper, $K_a$ band radar data from January 2014 to December 2017 are used to statistically analyze the macro physical characteristics of cloud in Beijing. The average cloud occurrence frequency during the four years is about 36.3%. The maximum monthly-averaged cloud occurrence frequency is in September and the minimum is in December. Cloud occurrence frequency has obvious daily variation in spring and summer, which increase from 11 am o’clock to 17pm o’clock up to 15%, then decrease gradually. The average cloud bottom height (CBH) during 4 years is 4.9km and cloud top height (CTH) is 7.2km. The CBH and CTH rise from January gradually, reach the peak in June, fall to minimum in December. During March to October, high-level clouds (CBH >5km) account for 50%. Clouds with cloud thickness (CT) < 1km are in the majority in each month. The proportion of clouds with CT between 1 ~ 4km decreases in the increase of CT. From April to September, clouds with CT > 4km accounted for second highest proportion. Statistics show that single-layer clouds account for 66.7%, double-layers clouds account for 25.2%, and 8.1% are multiple-layers clouds. About 80% clouds are single layer in winter. The climatological characteristics, especially the vertical distribution of cloud in Beijing, are characterized numerically based on radar data in high temporal and spatial resolution. Knowledge gained from this work will present references for understanding regional cloud climatic characteristics as well as the cloud parameterization in climate model.

Keywords: Ka radar, Climate characteristic, cloud