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A Cloud Type Identification Model Using Basic Meteorological Elements

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Cloud impacts the radiation transportation in the air-earth system, itself is a carrier of water in global hydrological circulation, it influences aviation by its droplet and wind/stability distribution. Cloud type identification is mainly from the view of satellite and/or ground observation, focusing on what happened. It's still an issue to research in the environment not happened, such as middle-range model outputs and simulated future climate scenarios. In this research, a cloud type identification model is constructed using basic meteorological elements, such as geo-potential height, temperature and relative humidity. The model has following aspects: cloud detection through critical relative humidity, the liquid water/ice path determined by experimental profile, the precipitation diagnosed through the precipitation rate. One cloud layer is measured by cloud bottom height, cloud top height, cloud thickness, liquid water path, ice path, and precipitation−totally six parameters. Cloud type is identified by the statistical cloud observation features, then a vertical geometrical matching method is used as a lattermost procedure for those can't be classified. Cloud is identified into 9 types, they are Stratus, Stratocumulus, Cumulus, Cumulonimbus, Nimbostratus, Altostratus, Altocumulus, Cirrostratus, and Cirrocumulus/Cirrus. The model is further evaluated using NCEP/NCAR reanalysis data. The cloud occurrence probability, mean cloud layer amount, individual cloud type occurrence probability, mean individual cloud bottom height, top height, thickness, and total water path are computed. The result shows the cloud type identification model is reasonable in general, and usable in simulated atmosphere. (This research is supported by National Key R&D Program of China with Grand No. 2018YFC1507604)