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Cloud Types and Cloud Phase Products of Fengyun Satellite

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Clouds have a significant impact on the radiation budget balance, heat balance, and humidity distribution of the Earth atmosphere system. Water clouds and ice clouds have different impacts on the energy balance of the Earth. Water clouds with lower heights reflect shortwave radiation, while ice clouds with higher development heights can absorb outward radiation from the Earth or return it to the Earth's surface. Therefore, accurate judgment of cloud phase is of great help for conducting research on atmospheric radiation budget and for comprehensively understanding global atmospheric environment and climate change.

The process of cloud phase classification is to extract features based on the optical properties of clouds, obtain a series of spectral and texture features that describe various cloud/surface types, and classify them accordingly. Using the observation data of four infrared channels (7.0, 8.5, 10.8, 11.8 μ m) of China's Fengyun meteorological satellite, and using CMA-GFS as auxiliary data to predict the large temperature and humidity profiles of the field, a new generation of Fengyun polar orbit and geostationary meteorological satellite cloud phase inversion algorithm has been developed in China. The cloud's effective emissivity, which is closely related to a single channel or wavelength, cannot obtain the microphysical information of the cloud, and spectral changes in the cloud's effective emissivity need to be utilized. In order to effectively utilize this feature, the effective cloud emissivity can be used to calculate the effective absorption optical thickness ratio, i.e. β Compare. For multi-channel

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combinations β Liquid water clouds and ice clouds can be distinguished within the radius range of most effective examples. Unlike traditional inversion methods that use bright temperature differences, β The relationship between them is only a function of the microphysical properties of clouds. β (12/11) μ m) Sensitivity to cloud particle size can be used to assist in determining opaque clouds. Therefore, we use water clouds and ice clouds to β (8.5/11 μ m) And β (12/11) μ m) Calculate the composition of clouds using different textures on.

At present, the Fengyun 4 geostationary meteorological satellite can provide cloud types and phase products of 4km, 5 minutes (in the Chinese region), and 15 minutes (in the full disk). The Fengyun 3 polar orbit meteorological satellite can provide cloud types and phase products of 1km (in the 5 minute segment), 0.05 ° (global daily synthesis), which can provide reference information for understanding the cloud radiation feedback process in climate