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**Equivalent cloud property retrievals algorithm based on the FengYun-4  
Geostationary Interferometric Infrared Sounder (GIIRS)**

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The Geostationary Interferometric Infrared Sounders (GIIRS) onboard FengYun-4A and FengYun-4B (FY4) satellites are two of the first infrared hyperspectral atmospheric vertical sounder onboard geostationary satellites. GIIRS contains approximately 700 channels in the infrared (IR) band, which provides abundant information for cloud property retrievals, but there are currently few cloud parameter retrieval algorithm specifically designed for GIIRS. The Nadir point resolution of GIIRS is 16 km, while the spatial scale of most common water and ice clouds is generally in the range of several hundred meters to several kilometers, which leads to the heterogeneity of clouds in the GIIRS observation fields, and makes the corresponding cloud parameter retrieval challenged. Through statistical analysis of MODIS L2 data, we found that there are large gaps in the heterogeneity of clouds among the observation fields for instruments with different resolutions (e.g., from 4 km to 16 km). In general, the heterogeneity of clouds in the observation field increases with the increase of the spatial resolutions of satellite instruments. Therefore, in order to reduce the influence of cloud heterogeneity in GIIRS observation field (16 km) on cloud parameter retrieval, we proposed to construct GIIRS cloud parameter retrieval algorithm using Radiative Transfer for TOVS (RTTOV) to obtain equivalent cloud parameters. The retrieval results show that in the selected observation channels, the bright temperature differences between the simulated results and the

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observation results are less than 3 K, while the differences in the gas absorption channels could be much larger due to the uncertainties on the atmospheric profiles.