

FY-4B/GIIRS performance status and the on-orbit calibration activities

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ABSTRACT

The Geostationary Interferometric Infrared Sounder (GIIRS) onboard FengYun-4B (FY-4B) satellite is China second Fourier transform spectrometer (FTS) on the geostationary orbit. GIIRS measures the atmospheric upwelling infrared radiance over two spectral bands: the long-wave IR (LWIR) band from 680 to 1130 cm^{-1} , and the mid-wave IR (MWIR) band from 1650 to 2250 cm^{-1} , with spectral sampling interval of 0.625 cm^{-1} in both bands. The observed spectra provide a critical high vertical resolution information to retrieve the atmosphere's structure of temperature and water vapour in retrieval algorithms and numerical weather prediction (NWP) models, and also supply extensive information about trace gases, surface and cloud properties for climate research.

FY-4B/GIIRS was launched on June 3, 2021. Since June 30, 2022, the FY-4B ground processing system has continuously generated the L1 data and has disseminated it to user communities. In the past three years, the GIIRS instrument has been operating normally in orbit. Although the spectral response of the instrument decreases continuously, which is caused by contamination by silica gel gas in some channels, the noise performance of most pixels always meet the requirements for the GIIRS mission. The spectral calibration accuracy is stable, with an averaged spectral offset of less than 10 ppm in both LWIR and MWIR band.

In recent two years, the L1 team has been committed to improving the accuracy and stability of GIIRS on-orbit calibration. As the clutter signal in the LWIR detector circuit has been eliminated, the spectral oscillation among the odd and even pixels has been suppressed, and the consistency of radiometric calibration has been improved. The increase of the temperature of the instrument at night will lead to degradation of the spectral calibration. We dynamically update the spectral calibration coefficients with temperature fluctuations, thus further improving the stability of the spectral calibration.