Uncertainty Evaluations of the CRCS In-orbit Field Radiometric Calibration Methods for Thermal Infrared Channels of FENGYUN Meteorological Satellites

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Meteorological satellites have become an irreplaceable weather and ocean-observing tool in China. These satellites are used to monitor natural disasters and improve the efficiency of many sectors of Chinese national economy. It is impossible to ignore the space-derived data in the fields of meteorology, hydrology, and agriculture, as well as disaster monitoring in China, a large agricultural country. For this reason, China is making a sustained effort to build and enhance its meteorological observing system and application system. The first Chinese polar-orbiting weather satellite was launched in 1988. Since then China has launched 17 meteorological satellites, 8 of which are sun synchronous and 9 of which are geostationary satellites; China will continue its two types of meteorological satellite programs.

In order to achieve the in-orbit absolute radiometric calibration of the operational meteorological satellites’ thermal infrared channels, China radiometric calibration sites (CRCS) established a set of in-orbit field absolute radiometric calibration methods (FCM) for thermal infrared channels (TIR) and the uncertainty of this method was evaluated and analyzed based on TERRA/AQUA MODIS observations. Comparisons between the MODIS at pupil brightness temperatures (BTs) and the simulated BTs at the top of atmosphere using radiative transfer model (RTM) based on field measurements showed that the accuracy of the current in-orbit field absolute radiometric calibration methods was better than 1.00K (@300K, K=1) in thermal infrared channels. Therefore, the current CRCS field calibration method for TIR channels applied to Chinese metrological satellites was with favorable calibration accuracy: for 10.5-11.5\textmu m channel was better than 0.75K (@300K, K=1) and for 11.5-12.5\textmu m channel was better than 0.85K (@300K, K=1).