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PRC-WP-09
Prepared by CMA
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FY-2C Meteorological Satellite Calibration

No action is requested.

FY-2C Meteorological Satellite Calibration

1. Overview

The FY-2C geo-stationary meteorological satellite is spin-stabilized. VISSR is the primary instrument onboard the FY-2C. Calibration for VISSR is implemented before and after launching the satellite. Pre-launch calibration for visible channel is conducted outdoor in carefully-selected areas in Kunming and Dali, Yunnan Province of China. Usually there is considerable error with the result of field calibration because of inconsistent outdoor condition that influences the calibration, for instance, the changing solar angle, and air conditions (water vapor contents, aerosol etc.). For infrared channels, the pre-launch calibration is conducted in a vacuum container simulating the space environment.

Two approaches are mainly relied on for post-launch calibration, one is by the field radiation calibration, and the other is inter-calibration.

2. Calibration for visible channels

As there is no calibration unit for visible channels onboard the FY-2C satellite, pre-launch calibration is mainly relied on and often used as the standard for other calibration methods.

The solar image at midnight is taken with a triple prism. However, as it's difficult to obtain accurately the albedo from the solar image before the satellite launch, the solar image is only used as a reference in monitoring the attenuation of visible sensors.

Post-launch calibration for visible channel is by taking the measurement on the calibration field (Dunhuang Calibration Site), and by comparison with the synchronous satellite observation. The field measurements include the surface reflectivity, atmosphere optical thickness, and water vapor content. Processing of the measured data is with 6S model to calculate the incoming radiation at the satellite, which is further used to calculate the calibration coefficients.

The 47° zenith angle of FY-2C (normal position 105E) is relatively unchanged relevant to the calibration site. As it exceeds the 30° , BRDF correction is carried out in data processing.

3. Calibration for infrared channel

The FY-2C satellite is spin-stabilized. The sensor regularly takes signal from deep space as black body. However, the input signal from the black body and the input signal from the object share only part of optical paths with each other. The fact that two signals take different optical paths before reaching the sensor makes it impossible to get absolute calibration value for IR channels.

Post-launch calibration is provided on the Qinghai Hu Lake Calibration Site for FY-2C. The measurements of radiation over the lake water surface, the atmospheric optical thickness and air water vapor content are taken. MOTRAN model is used to calculate the satellite incoming radiance.

In CMA/NSMC, the inter-calibration is operationally used. NOAA satellite data is used to calibrate FY-2C geo-stationary satellite. The GAC data of AVHRR channel 4 is used to calibrate the long wave IR channel. The channel 12 (WV) of HIRS/3 of NOAA is used to calibrate WV channel of FY-2C.