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Cross calibration of DPC and POSP onboard Chinese GaoFen-5(02) satellite

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The Chinese GaoFen-5(02) satellite in Chinese High-resolution Earth Observation Program was launched on September 7, 2021. For remote sensing of PM2.5 from space, the "Polarization CrossFire (PCF) [1]" strategy including a PCF sensor suite and the Particulate Matter Remote Sensing (PMRS) [2,3] model has been developed and first implemented on GaoFen-5(02) satellite. The PCF suite consists of the particulate observing scanning polarimeter (POSP) [1] and the directional polarimetric camera (DPC) [1,4,5]. Among them, DPC is a multi-angle sequential measurement polarization imager, and POSP is a cross-track scanning simultaneous polarization radiometer with higher precision, and has on-board radiometric and polarimetric calibrators, which can theoretically be used for cross comparison and calibration with DPC. The geolocation evaluation and field of view (FoV) matching method to ensure the consistency of observation time and space between two sensors is studied in detail by carrying out aviation experiments before launch of the satellite. And in order to evaluate the accuracy of polarimetric cross calibration, the onboard polarimetric calibration and validation are firstly carried out to the reference remote sensor POSP. Then according to the geometric characteristics of the data set, preliminary research on radiometric and polarimetric cross-calibration based on level 1 and level 0 products of DPC are conducted respectively. Compared with the traditional vicarious calibration methods using natural targets used by sensors like DPC with a large field of view (>50° off nadir), the cross calibration and validation between different sensors on the same satellite show significant advantages in terms of precision, calibration frequency, and reliability.

Keywords: Fine particulate matter PM2.5; Polarimetric remote sensing; Cross calibration; Measurement precision;

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