

## On-orbit geometric calibration and geolocation evaluation of Directional Polarimetric Camera onboard China Gaofen-5 02 satellite

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The Directional Polarimetric Camera (DPC) is a space-borne optical instrument with a large FOV, which has the capability of multi-angle, multi-spectrum, and polarization detection and has broad application prospects in the inversion of aerosol and cloud characteristics. Due to the difference between the on-orbit operating environment and the laboratory environment and the severe vibration during the launch process, there are certain differences between the DPC on-orbit geometric performance and the laboratory calibration results. An on-orbit autonomous geometric calibration method based on the consistency of geolocation of homologous points between multi-angle images is proposed<sup>[1]</sup>. The on-orbit geometric calibration of the DPC's distortion coefficient, distortion center coordinates, and installation angle are systematically performed. Finally, the geolocation accuracy before and after on-orbit geometric calibration is systematically evaluated based on the coastline inflection point method<sup>[2]</sup>. Before on-orbit geometric calibration, there were significant differences in the geolocation accuracy of the DPC in different areas of the image plane and different regions of the world, with an average geolocation accuracy of 3.222 km. After on-orbit geometric calibration, the consistency of the geolocation accuracy of DPC significantly improved across different areas on the image plane and different regions of the world, with an average geographic positioning accuracy of 1.504 km.

**Keywords:** geometric calibration, geolocation, Directional Polarimetric Camera

### References

- [1] G. F. Xiang, B. H. Meng, B. H. Tu, et al. On-Orbit Autonomous Geometric Calibration of Directional Polarimetric Camera[J]. *Remote Sensing*, 2022, 14(18): 4548.
- [2] L. F. Hoffman, W. L. Weaver, J. F. Kibler. Calculation and accuracy of ERBE scanner measurement locations. NASA Technical Paper 2670, NASA Langley Research Center, Hampton, Virginia, USA, 1 September 1981.