

Performance Assessment and On-Orbit Calibration of the First Operational DoFP Spaceborne Multi-Angular Polarimeter GAPMAP-0

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GAPMAP-0, a Multi-Angular Polarimeter (MAP) onboard the Adler-2 mission launched in April 2023, is the first operational spaceborne polarimetric sensor based on the Division of Focal Plane (DoFP) architecture. Its on-orbit radiometric and polarimetric performance is essential for quantitative remote-sensing retrievals ^[1], especially for advanced algorithms such as the Generalized Retrieval of Atmosphere and Surface Properties, GRASP ^[2].

This study presents the on-orbit calibration and validation (Cal/Val) of GAPMAP-0 using dedicated scanning-mode observations and natural targets ^[3], including Pseudo-Invariant Calibration Sites (PICS) and cloud scenes. The results show that the polarimetric measurement accuracy generally satisfies the design requirements, while the radiometric measurements exhibit drift that requires on-orbit correction. The potential improvement in retrieval performance after calibration will be further evaluated using GRASP-based retrieval experiments.

Moreover, the limited attitude control capability of the small-satellite platform introduces geometric positioning errors due to anomalous attitude data. To address this issue, an attitude anomaly correction strategy was developed and validated using the Coastline Inflection Method (CIM) ^[4]. These Cal/Val methods improve the radiometric, polarimetric, and geometric quality of GAPMAP-0 data and supports its future quantitative applications.

References

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