3MI, the multi-view polarimeter flying on Metop-SGA: concept, calibrations, and products

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The Multi-Viewing-Channel-Polarisation Imager (3MI) is planned to fly on the Metop-SGA satellites as part of the EUMETSAT Polar System – Second Generation (EPS-SG) programme in the timeframe beyond 2020. It is a radiometer dedicated to aerosol and cloud characterisation for climate monitoring, atmospheric composition, air quality, and numerical weather prediction

This polarimetric mission is a heritage of the POLDER mission, with improved capabilities. The spectral range (12 channels) was extended from the visible–near-infrared (VIS-NIR) 410 to 910 nm) to the shortwave-infrared (SWIR) domain (up to 2200 nm). The spatial resolution (4 km at nadir) and the swath (2200×2200 km^2) were also improved compared to previous POLDER instruments. As POLDER, 3MI will provide multi-polarisation (–60°, 0°, and +60°) and multi-angular (10 to 14 views) images of the Earth top of atmosphere outgoing radiance [1].

The POLDER heritage allows adapting techniques developed for PARASOL, e.g., for the vicarious calibration methods. However the monitoring of the SWIR channels will be a new challenge for the 3MI calibration. The access to a moon observation during commissioning would be very beneficial, in addition to the characterization of many other radiometric aspects. The 3MI will also strongly benefit from cross-calibration (radiometric, spectral, and geometric) with other Metop-SGA instruments like the VIS-IR Imager (METimage) and the ultraviolet–VIS-NIR-SWIR Sounder (Sentinel-5).

The level 1 products available to the users will be geolocated Stokes vectors on the native geometry (Level 1B) and geoprojected multi-directional and spectral Stokes vectors (Level 1C) [2]. Level-2 products will provide geophysical and microphysical parameters for aerosol and clouds. The presentation will overview the mission characteristics and the calibration strategy as well as the products available to the users.

References

[1] Fougnie, B., T. Marbach, A. Lacan, R. Lang, P. Schlüssel, G. Poli, R. Munro, and A. B. Couto, 2019: The multi-viewing multi-channel multi-polarisation imager –Overview of the 3MI polarimetric mission for aerosol and cloud characterization. *J. Quant. Spectrosc. Radiat. Transfer* **219**, 23–32.

[2] Lang, R., G. Poli, B. Fougnie, A. Lacan, T. Marbach, J. Riedi, P. Schlüssel, A. B. Couto, and R. Munro, 2019: The 3MI Level-1C geoprojected product –definition and processing description. *J. Quant. Spectrosc. Radiat. Transfer* **225**, 91–109.

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