

In-Flight Characterization of 3MI Polarisation

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The 3MI instrument was launched in August 2025 on board the EPS-SG A satellite. The purpose of 3MI is to provide multi-spectral, multi-polarisation, and multi-angular images of the Earth TOA outgoing radiance to characterise the microphysical properties of the atmosphere. The design consists of two detectors (SWIR and VNIR) and a rotating filter and polariser wheel [1]. The instrument acquires images under 12 spectral bands ranging from 410 nm to 2130 nm. Nine of the bands acquire polarised images at 60°, 0° and -60°. The three components of the Stokes vector (I, Q, U) are derived from this triplet (P1, P2, P3) of polariser acquisitions. The multi-view is achieved by several successive overlapping acquisitions of the same Earth-Atmosphere target under 14 different angles, thanks to the large FOV of 3MI. At L1, 3MI provides the three (I, Q, U) components as two different products to users: L1B, which corresponds to the native geometry, as the satellite orbits the Earth; and L1C, which contain, for each point on the surface, the multiple angles under which it is observed.

Following the launch and after a successful SIOV, the instrument underwent a very thorough commissioning phase, in cooperation between CNES and EUMETSAT. Understandably, the requirements both at radiometric and geometric level are extremely strict, especially in what refers to polarisation: the amount of polarised light from observations is normally very low, except for certain very favourable Sun-Satellite geometric conditions and targets. In this talk we will present the different approaches adopted for polarisation characterisation, including Moon acquisitions, Sun-glint modelling, and Rayleigh diffusion, and the associated results.

References

- [1] Fougnie, B. et al., 2018: The multi-viewing multi-channel multi-polarisation imager – Overview of the 3MI polarimetric mission for aerosol and cloud characterization. *Journal of Quantitative Spectroscopy & Radiative Transfer* 219 (2018) 23–32.

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