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OSIRIS (Observing System Including PolaRisation in the Solar Infrared Spectrum) instrument : a multi-directional, polarized radiometer in the visible and shortwave infrared, airborne prototype of 3MI / EPS-SG Eumetsat – ESA mission

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OSIRIS instrument largely inherits from the POLDER concept developed and operated between 1991 (first airborne prototype) and 2013 (end of the POLDER-3/PARASOL space-borne mission).

It consists in two optical systems, one covering the visible to near infrared range (440, 490, 670, 763, 765, 870, 910 and 940 nm) and a second one for the shortwave infrared (940, 1020, 1240, 1360, 1620 and 2200 nm). Each optical system is composed of a wide field-of-view optics (114° and 105° respectively) associated to two rotating wheels with interferential filters (spectral) and analyzers filters (polarization) respectively, and a 2D array of detectors. For each channel, radiance is measured once without analyzer, followed by sequential measurements with the three analyzers shifted by an angle of 60° to reconstruct the total and polarized radiances. The complete acquisition sequence for all spectral channels last a couple of seconds according to the chosen measurement protocol. Thanks to the large field of view of the optics, any target is seen under several viewing angles during the aircraft motion.

In a first step we will present the ground characterization of the instrument based on laboratory measurements (linearity, flat-field, absolute calibration, induced polarization, polarizers efficiency and position), the radiometric model and the Radiometric Inverted Model (RIM) used to develop the Level 1 processing chain that is used to produce level 1 products (normalized radiances, polarized or not, with viewing geometries) from the instrument generated level 0 files (Digital Counts) and attitude informations from inertial system. The stray light issues will be specially discussed.

In a second step we will present in-flight radiometric and geometric methods applied to OSIRIS data in order to control and validate ground-based calibrated products : molecular scattering method and sun-glint cross-band method for radiometric calibration, glories, rainbows and sun-glint targets for geometric calibration control.