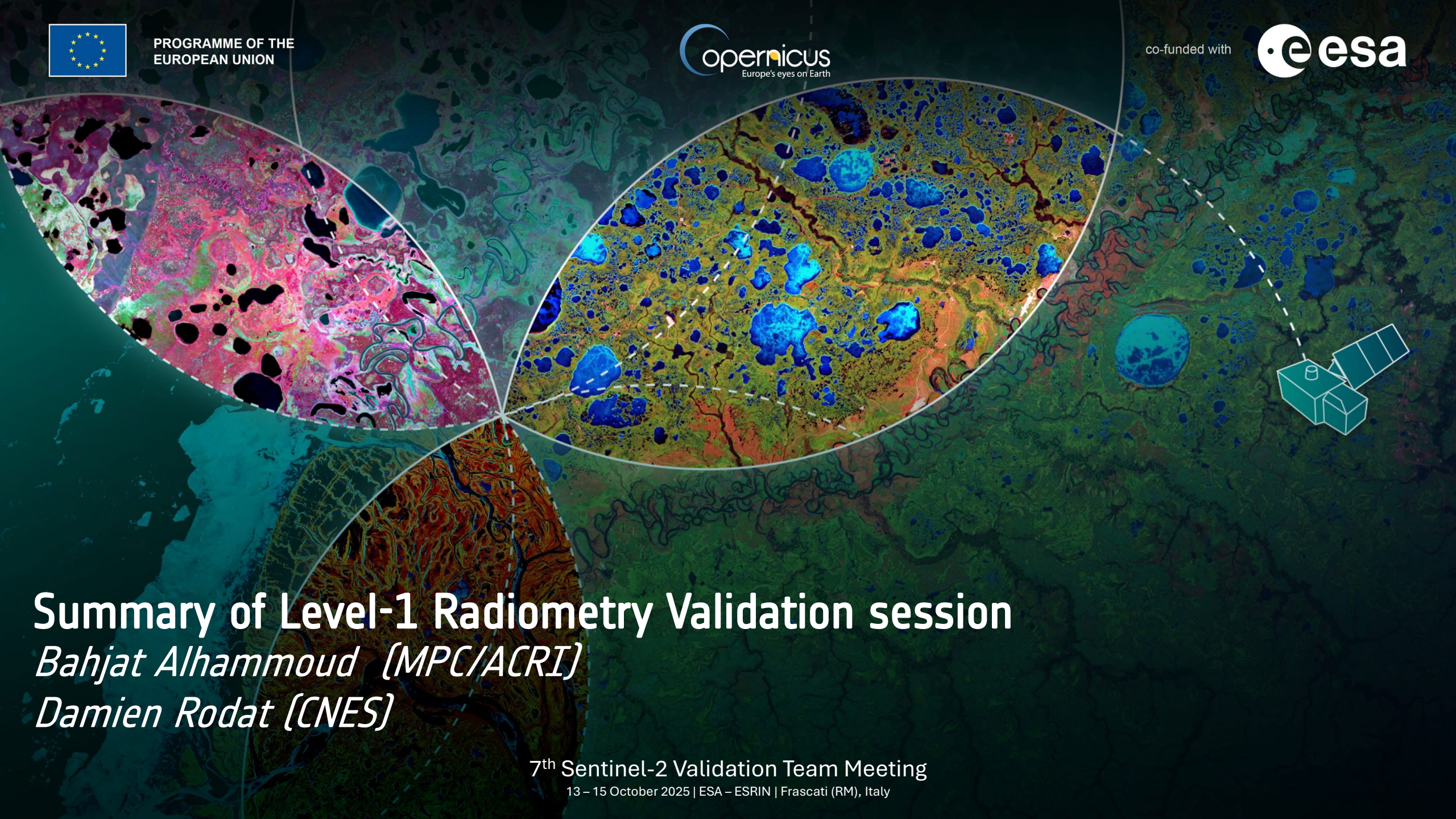




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Summary of Level-1 Radiometry Validation session

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The session included 10 presentations:

- 7 talks given by the OPTical Mission Performance Cluster (OPT-MPC);
- 1 talk from a company (Rayference);
- 2 talks from space agencies (ESA, CNES).

Agenda:

1. Impact Of the Spectral Response Variations on Sentinel-2C TOA Reflectance, B.Lafrance.
2. Recent Improvements of MSI Radiometric Calibration and Characterization of The Impact of Differences in Spectral Responses Between Sensors, B. Lafrance
3. Comparison of the Sentinel-2C MSI lunar acquisitions with LIME, S. Adriaensen
4. Impact of Polarization on Radiative Transfer Simulation for Vicarious Calibration of Sentinel-2 MSI, N. Marton
5. Sentinel-2 MSI Level-1 Radiometric Uncertainty Tool, status and application to tandem analysis, A. Deru
6. Copernicus Sentinel-2 Level-1 Radiometric Validation Status from the Optical MPC, B. Alhammoud
7. Cross-Missions Intercomparison of Level-1 Radiometric Products: Sentinel-2, Sentinel-2, Landsat-8 and Landsat-9, B. Alhammoud
8. Sentinel-2 MSI Level 1 radiometric inter-comparisons using Deep Convective Clouds and application to OLI, SLSTR and MODIS inter-comparisons, L. Rivoire
9. Sentinel-2 dynamic range assessment in support of next generation missions, S. Proud
10. Sentinel-2 Geometric and Radiometric Validation Activities Performed by CNES, H. Méric

In the following slides, references between brackets refer to this numbering.



Sentinel-2/MSI A, B & C continue **their excellent radiometric performance** which meets the objective requirements :

- SNR higher than the specification [6];
- FPN within the specification [6];
- absolute calibration within 3 % [3, 6, 10];
- cross-mission inter-comparison within 3 % [7, 8, 10];
- inter-band calibration within 1 % [10].

These validations are obtained by independent teams from OPT-MPC and CNES based on various CAL/VAL methods:

- Pseudo-Invariant Calibration Site (PICS), desert and dome [6, 7, 10];
- Rayleigh scattering [6, 10];
- Deep Convective Clouds (DCC) [8, 10];
- Instrumented sites [6, 10];
- Moon [3, 10].

The presentations have a rich content which can hardly be summarized; but we can highlight the following points:

- the **S2A/S2C tandem phase** was used to:
 - evaluate the radiometric bias between S2A and S2C [2, 6, 8, 10];
 - perform a first validate the uncertainty computations [5];
- an **in-flight diffuser calibration** (yaw manoeuver) has greatly improved the calibration results for S2C [2];
- the **per-pixel spectral response** characterization enables in-depth studies [1, 2];
- a new tool to compute **Sentinel-2 L1 uncertainty** is available (L1 RUT) [5];
- Sentinel-2 **Next Generation** is on-going [9].



Throughout the presentations and discussions, some recommendations to Sentinel-2 users were gathered:

- the **spectral response variation** from one sensor to another can induce up to ~10 % variation on the measurements [1, 2];
- in radiative transfer simulation for Sentinel-2, the bluest band requires an algorithm which includes the **polarization effects** (responsible for up to ~10 % of B01 signal) [4].



Throughout the presentations and discussions, some recommendations to Sentinel-2 CAL/VAL teams were gathered:

- applying the **DCC method on geostationary missions** would be of interest to study BRDF and temporal effects [8];
- the LIME Moon calibration can be broaden to the **Moon products acquired by Landsat 8 and 9** [3];
- some **additional uncertainty sources** are under investigation for the L1 RUT tool [5].



Throughout the presentations and discussions, some recommendations to the Sentinel-2 mission were gathered:

- the new elements introduced with S2C would be of great interest for Sentinel-2 sensors:
 - a **S2A/S2B tandem** phase [5];
 - a **yaw manoeuver** [2];
 - operational **Moon** acquisitions for all Sentinel-2 [3, 10];
 - a **per-pixel characterization of spectral responses** for S2D and S2NG [1, 2];
- for Earth Observation, the **spectral responses variations** among a constellation and along the swath should be constrained to help multi-sensor analyses [1, 2];
- for the next generation of sensors, lowering the B10 saturation level may have impact on the DCC calibration method [8, 9];
- the **SWIR range CAL/VAL challenges** will have to be anticipated for S2NG [9].