

Updates on lunar calibration and lessons learned

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- USGS ROLO established as a reference for lunar calibration since 2005
- Since then, series of implementations by calibration teams, based on Kieffer & Stone 2005
- 2014: development of the GSICS Implementation of the ROLO model, in collaboration with T. Stone – USGS → endorsed as the new shared international reference at the 1st CGMS/GSICS – CEOS/WGCV IVOS Lunar Calibration Workshop
- Development of new models or modified versions of the ROLO formulation (ESA/LIME, EUMETSAT/LESSR, CSU/CLIMES, H. Kieffer/SLIM, AIST/SP)
- Need to understand better the performances + uncertainties of the existing models with respect to each other
- 1st inter-comparison exercise in 2023

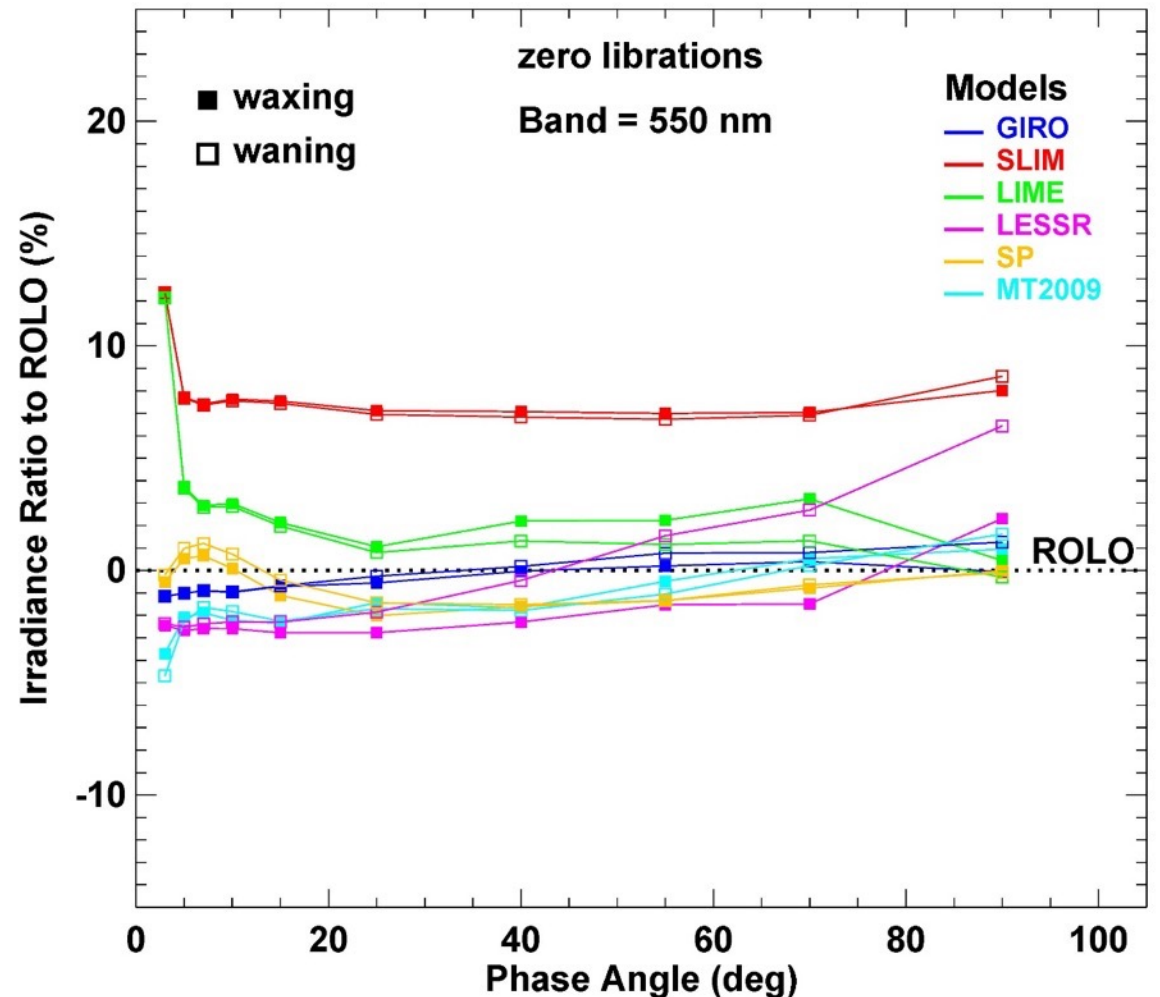
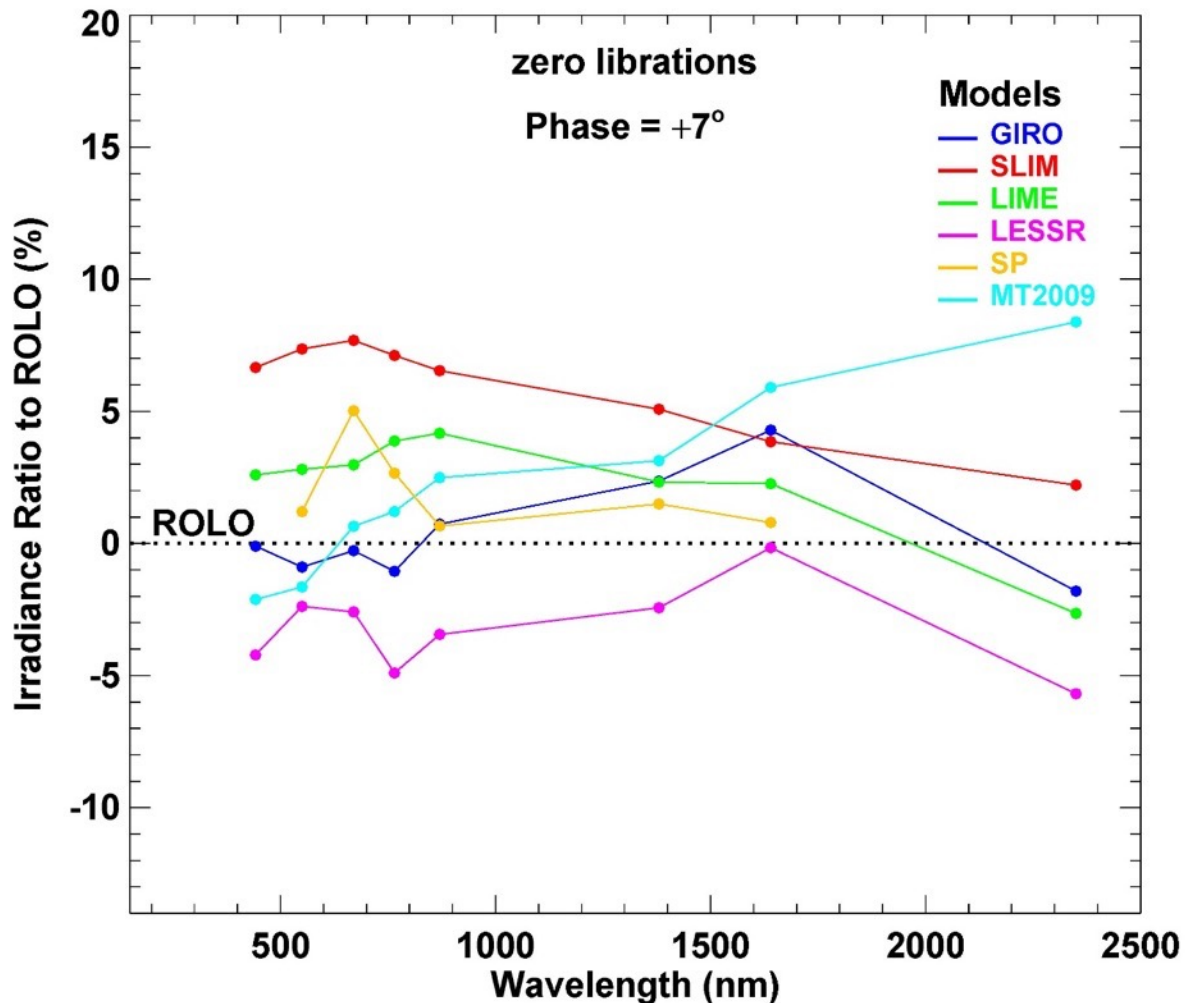


Overview of the 1st lunar model inter-comparison exercise

www.eumetsat.int

Results presented at the 4th LCWS (see presentation on gsicsweb.eumetsat.int)

Example plots: comparisons relative to ROLO





- Models have evolved (e.g. LIME, LESSR, SLIM, GIRO [to align with current ROLO model], Miller-Turner)
- Need to liaise with GSICS and IVOS partners about new models
- Complement current benchmark (geometrical + spectral coverage)
- Use of a common framework (LSICS) to run the exercise → models to be “plugged” into LSICS
- 5th CGMS/GSICS – CEOS/WGCV IVOS Lunar Calibration WS
- Q4 2026 in EUMETSAT Headquarters – Darmstadt, Germany



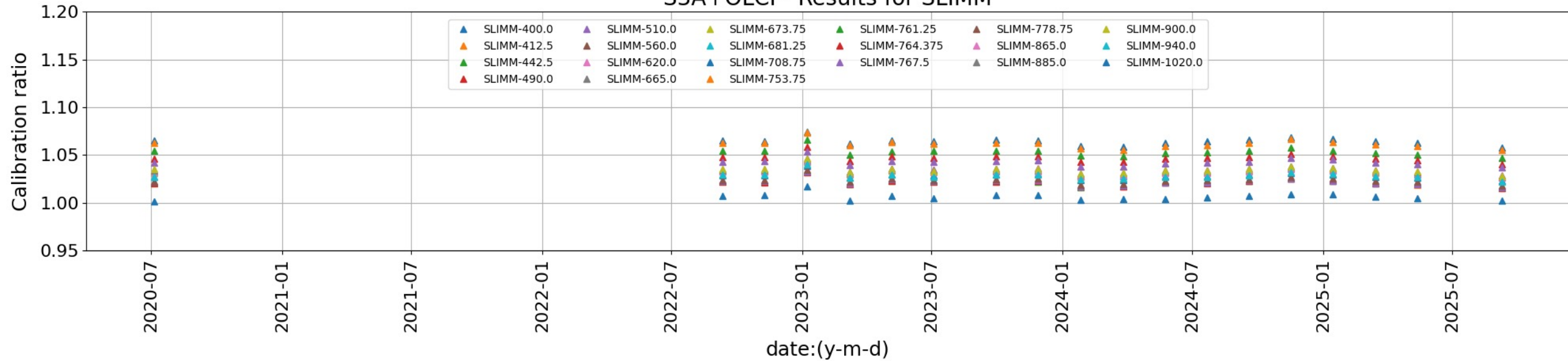
What is LSICS?

- LSICS = GSICS Lunar Spectral Irradiance Calibration System
- GSICS deliverable, by the GSICS Lunar Calibration Subgroup
- To replace the GIRO as the new shared reference for lunar calibration
- Version 1.0 being prepared for release to the community early 2026
- Version 1.0 to include SLIM
- Framework developed in Python (for **portability**) with **modular** approach:
 - Geometry module (using JPL SPICE)
 - Disk Reflectance module (e.g. SLIM) → **place for integrating the models**
 - Lunar Irradiance module → TSIS solar irradiance spectrum
- GIRO (in C/C++) and LESSR (Python) have been tested in LSICS framework
- Definition of I/O **format specification** for **inter-operability** across missions
- **Backward compatibility with GIRO ensured!**

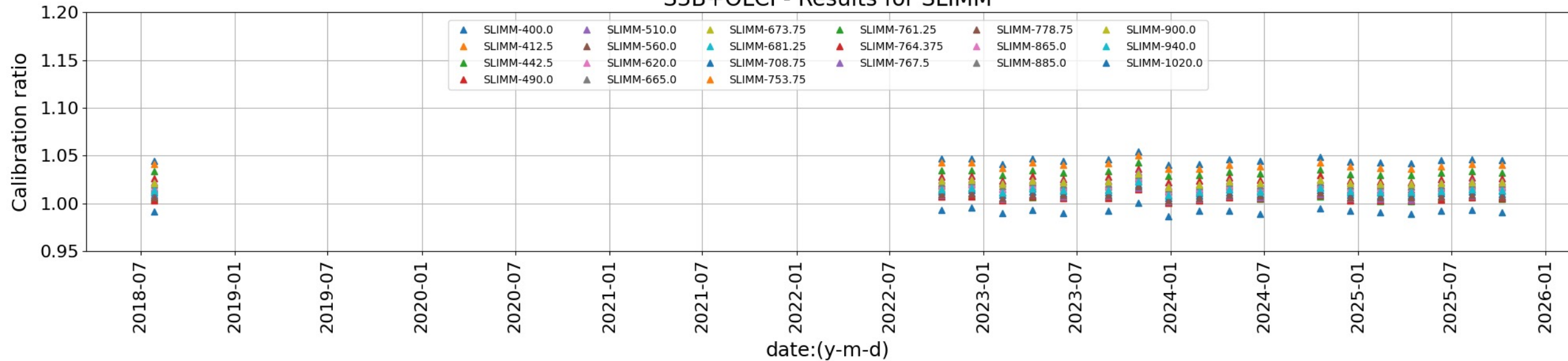


An example as a conclusion : S3A and S3B OLCI

S3A+OLCI - Results for SLIMM



S3B+OLCI - Results for SLIMM





Thank you!
Questions are welcome.



Back-up slides



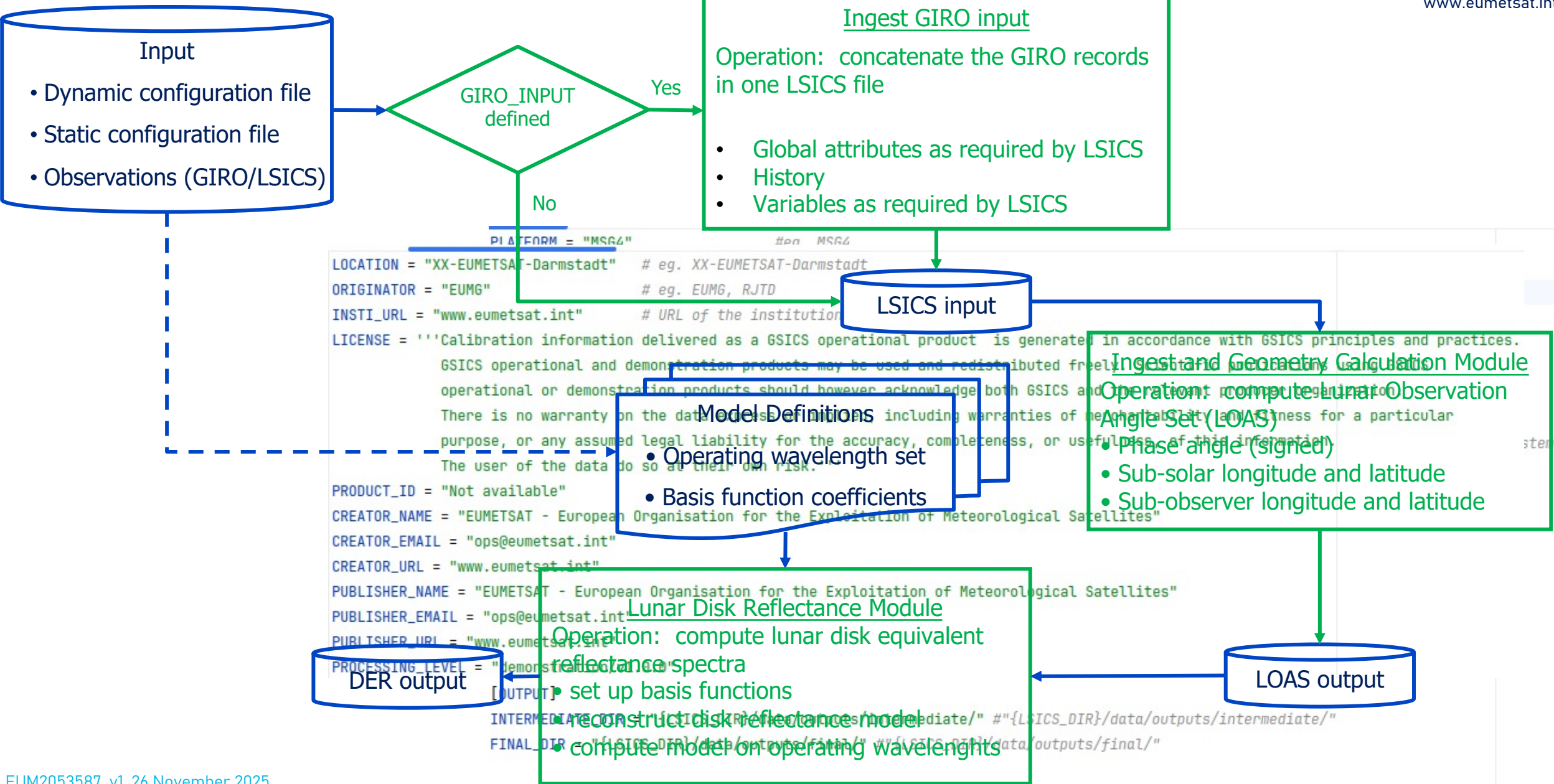
- Measurements and Moon Observations:
 - Measurements to serve a reference measurements for reflectance model inference
 - Review of existing datasets / discussion on data sharing
 - Uncertainty assessment and SI traceability
- Lunar Calibration Systems and Model Development
 - Status on the existing models (known + new models)
 - LSICS
 - What is needed to improve the absolute accuracy?
 - Results on the 2nd model inter-comparison → assume preparation well before the LCWS
- Instrument Monitoring using Lunar Calibration
 - Teams to present updates, with detailed explanation on how they estimates the observed lunar irradiance
 - Inter-calibration / inter-bands
 - Sensors temporal stability assessment + absolute calibration
- Thermal infrared and Microwave
 - Status of the model development
 - How to use lunar observations for radiometric assessment?
- Alternative Applications of Lunar Observations
 - Co-registration
 - MTF
 - Ghosts / straylight



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