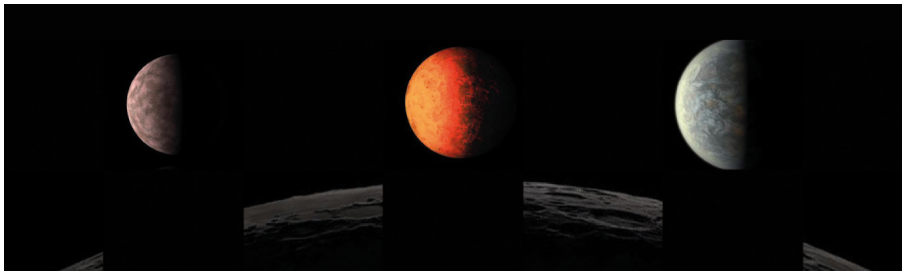

Contribution ID: **45** Type: **Poster**

Beyond Earth observation –Bridging the worlds of modern geospatial and planetary science

Friday 24 October 2025 12:30 (1 hour)

Earth Observation has undergone a significant transformation, progressing from the first temporally consistent satellite archives (e.g. Copernicus) into cloud-native, AI–ready ecosystems that now underpin climate research, disaster response and policy frameworks. Planetary science, driven by renewed lunar exploration, appears to be approaching a similar paradigm shift. The central challenge is not merely the acquisition of mission data, but its integration into platforms that are open, interoperable, and capable of supporting advanced, cross-disciplinary analyses.

BeyondEarth-STAC represents our conceptual approach to such a platform: an open lunar data lake harmonizing multi-mission datasets through the Spatio-Temporal Asset Catalog (STAC) standard. It currently consolidates terabytes of imagery, elevation models, hyperspectral measurements and surface composition maps. However, its significance lies less in the data volume than in the adoption of an reproducible approach and interoperable architecture. This framework extends to planetary science the same developments that are transforming Earth Observation: scalable cloud processing, semantic search, integration with advanced machine learning techniques.

The future of planetary data platforms will be multimodal. Embedding imagery, spectral information and geophysical measurements into unified representations could enable cross-domain reasoning and facilitate applications ranging from landing site assessment to predictive modelling of resource distribution.

If Earth Observation platforms today contribute to global climate monitoring and governance, planetary data lakes may play an analogous role in enabling sustainable lunar activities. They have the potential to become shared, transparent knowledge bases supporting international collaboration and long-term human presence on the Moon.

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Session Classification: Poster session