Geometrical Analysis of AMIE/Smart-1 Images and Applications to Photometric Studies of the Lunar Surface

D. Despan [1], S. Erard [1], A. Barucci [1], J.-L. Josset [2], S. Beauvivre [3], S. Chevrel [4], P. Pinet [4], D. Koschny [5], M. Almeida [5], B. Foing [5] and the AMIE team.

[1]LESIA Observatoire de Paris, France (daniela.despan@obspm.fr),
[2] Space Exploration Institute, Neuchâtel, Switzeland,
[3] Micro-cameras & Space Exploration, Neuchâtel, Switzerland,
[4] UMR 5562 CNRS/GRGS, Toulouse, France,
[5] ESA/ESTEC, Noordwijk, The Netherlands.

The Advanced Moon micro-Imager Experiment (AMIE) on board the ESA lunar mission Smart-1 performs colour imaging of the lunar surface using three filters at 750, 915 and 960 nm. The low pericenter, polar orbit, allows to obtain high resolution images in various locations at the surface. From the 300 km pericenter altitude, the field of view (5,3°x5,3°) corresponds to a spatial resolution about 30 m. The 1024x1024 images are shared by the various filters, allowing to derive mosaics of the surface in up to 3 colors depending on pointing mode. Spot-pointing observations and multiple observations from different orbits provide photometric sequences that allow to study the surface properties in restricted areas.
Geometrical analysis of the AMIE images relies on the SPICE system: image coordinates are computed to get precise projection at the surface, and illumination angles are computed to analyse the photometric sequences.
High resolution mosaics are then compared to lower resolution Clementine UV-Vis and NIR images. Spot-pointing sequences are used to constrain the photometric and physical properties of surface materials in areas of interest, based on Hapke's modeling.
Optical alignements parameters in the Spice kernels are currently derived to fit the Clementine basemap. However, significant discrepancies remain at high latitudes. Ultimately, they should be derived from re-analysis of in-flight star pointing observations.

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