High Resolution Maps of the Moon Surface with AMIE/SMART-1. 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 [6], B. Grieger [6], B.H. 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, [6]ESA/SCI-OS, Spain.

Introduction: The Advanced Moon micro-Imager Experiment (AMIE) on board the ESA lunar mission Smart-1 has performed color imaging of the lunar surface in three filters centered at 750, 915 and 960 nm [1]. The low pericenter, polar orbit, allowed to obtain a complete image coverage with high resolution at low to medium latitudes. From the 300 km pericenter altitude, the field of view (5.3°x5.3°) corresponds to a pixel size of about 27 m, a spatial resolution higher than Clementine [2]. The 1024x1024 pixels images are shared by the various filters, allowing to derive mosaics of the surface in up to 3 colors depending on pointing mode.

Maps of the lunar surface: The high resolution imaging makes possible detailed analysis of the morphological features and physical characteristics of the lunar surface. In order to construct AMIE data maps, systematic analysis and processing is being carried on using the whole data set. Figure 1 shows one of the results: a high resolution mosaic of the lunar North pole in the none filter area of the detector and details of the surface elements are visualized in Figure 2.

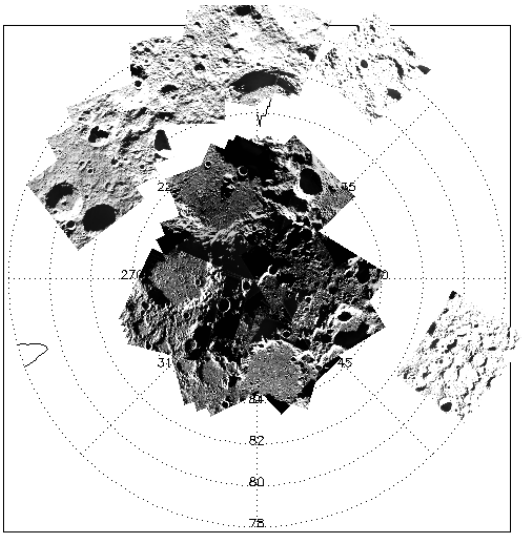

Figure 1: Mosaic of the lunar North pole with a coverage in latitude from 78° to 90° and in longitude from 0 to 360°.

Images from various orbits are first identified for each selected region of interest. These images are then selected according to signal to noise ratio, spatial coverage, and spatial resolution. Geometrical analysis of AMIE images relies on the SPICE system: image coordinates are computed to get precise projection at the surface, and illumination angles are computed to analyze the photometric sequences. The best images obtained with the neutral filter are calibrated, and mosaicked using the coordinates of the image frames corners. In the polar areas, images are selected so as to provide the best possible viewing of surface topography, depending on solar illumination angle, while preserving images continuity in shadowed areas.

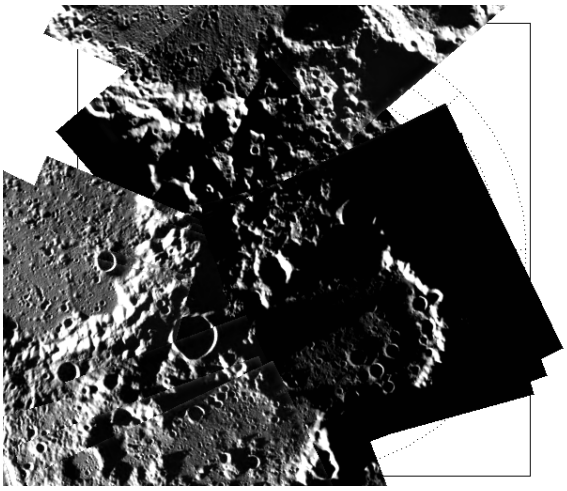

Figure 2: A North pole mosaic with a range in latitude from 87° to 90° and in longitude from 0 to 360°.

Mosaics of other regions of interest are provided with the AMIE high resolution observations of the lunar surface, typically a factor of 3 higher than the Clementine UV-vis camera. These regions are located at latitude ranging from 80° to 40°S, specially in the eastern hemisphere.

Prospects: Eventually, this method will be applied in all areas where AMIE has provided high resolution observations of the Moon surface.

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References: [1] Josset et al. (2006), *Adv. Sp. Res* 37, 14-20. [2] Pinet et al. (2005), *Planet. Space Sc.* 53, 1309-1318.