SMART-1 / AMIE CAMERA RESULTS. J.-L. Josset[1], S. Beauvivre[2], P. Cerroni[3], M. C. De Sanctis[3], P. Pinet[4], S. Chevrel[4], Y. Langevin[5], M. A.Barucci[6], D. Despan[6], S. Erard[6], P. Plancke[7], D. Koschny[7], M. Almeida[7], Z. Sodnik[7], S. Mancuso[7], B.A. Hofmann[8], K. Muinonen[9], V. Shevchenko[10], Yu. Shkuratov[11], V. Kaydash[11], M.Kreslavsky[11], P. Ehrenfreund[12] and B.H. Foing[7],
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Introduction: The Advanced Moon micro-Imager Experiment (AMIE), on board ESA SMART-1, the first European mission to the Moon (launched on 27th September 2003) [1-3, 8,9], is an imaging system with scientific, technical and public outreach oriented objectives. The science objectives are to image the Lunar South Pole, permanent shadow areas (ice deposit), eternal light (crater rims), ancient Lunar Non-mare volcanism, local spectro-photometry and physical state of the lunar surface, and to map high latitudes regions (south) mainly at far side (South Pole Aitken basin).

This paper presents a highlight of results obtained at the Moon.

AMIE instrument on SMART-1

AMIE (Advanced-Moon micro-Imager Experiment, PI J.L. Josset) is a miniature high resolution (40 m pixel at 400 km perilune height) camera, equipped with a fixed panchromatic and 3-colour filter, for Moon topography and imaging support to other experiments [1,
7,8,9,10]. The technical objectives are to perform a laserlink experiment (detection of laser beam emitted by ESA/Tenerife ground station), flight demonstration of new technologies and on-board autonomy navigation. The public outreach and educational objectives are to promote planetary exploration.
The micro camera AMIE is providing high-resolution CCD images of selected lunar areas. It includes filters deposited on the CCD in white light + three filters for colour analyses, with bands at 750 nm, 900 nm and 950 nm (measuring the 1 μm absorption of pyroxene and olivine).
AMIE images provide a geological context for SIR and D-CIXS data, and colour or multi-phase angle complement. The geometrical analysis of the images is dicussed in Despan et al (2007) [13]. Colour first results [10,11] are reported in Cerroni et al (2006, 2007). The photometric characterization of selected lunar sites [12] is described in Kaydash et al (2007).

Contribution of AMIE to planetary science:

SMART-1/AMIE has measured specific targets to study geophysical processes (cratering, volcanism, tectonics, erosion, deposition of volatiles) for comparative planetology.
Fig. 1 gives an example of the coupling between cratering and volcanic processes.

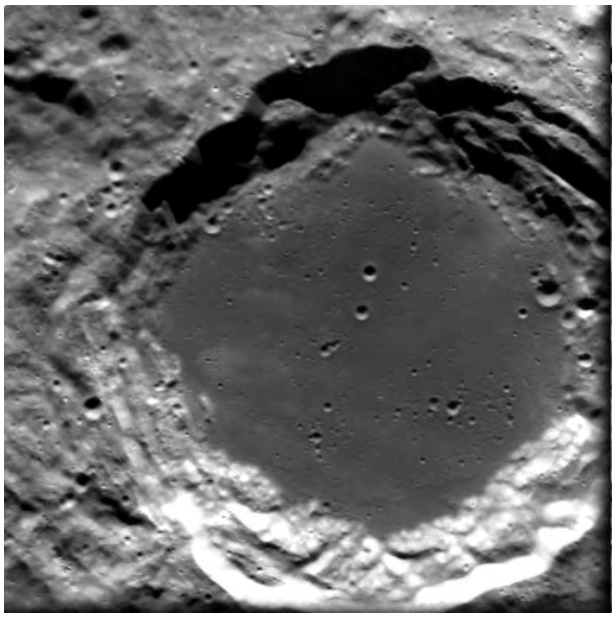

Fig. 1: Crater Lomonosov is a nice example for a large crater (92 kilometres in diameter) which was filled by lava after the impact, thus exhibiting a flat floor. The terraced walls indicate 'slumping', that is sliding of the rocks downwards due to gravity after the end of the impact.

SMART-1/AMIE science investigations include colour mapping studies [10,11] in support of D-CIXS X-ray elemental maps (Grande et al 2003) and SIR infrared mineralogy of the chemical composition of the Moon.

Landing sites studies

AMIE has observed a suite of previous landing sites for calibration purpose. It allows to connect the in-situ ground truth with remote measurements. This also helps to better quantify the potential of future sites for lander and rover activities.

AMIE has also performed high resolution maps in preparation for future landing sites.

Fig. 2: SMART-1's AMIE camera obtained this image of the lunar surface from an altitude of about 2000 kilometres. It covers an area of about 100 kilometres and shows the region around Hadley Rille centred at approximately 25° North and 3° East.

*The rille begins at the curved gash on the left side of this image, and is seen clearest in the rectangular, mare-floored valley in the centre of the image. It is over 120 kilometres long, and up to 1500 metres across and over 300 metres deep in place*s.

Polar measurements

Lunar North (Fig 3) and South pole repeated high resolution images have been obtained, giving a monitoring of illumination to map potential sites of 'eternal light' and 'eternal shadow', or sites relevant for future exploration .

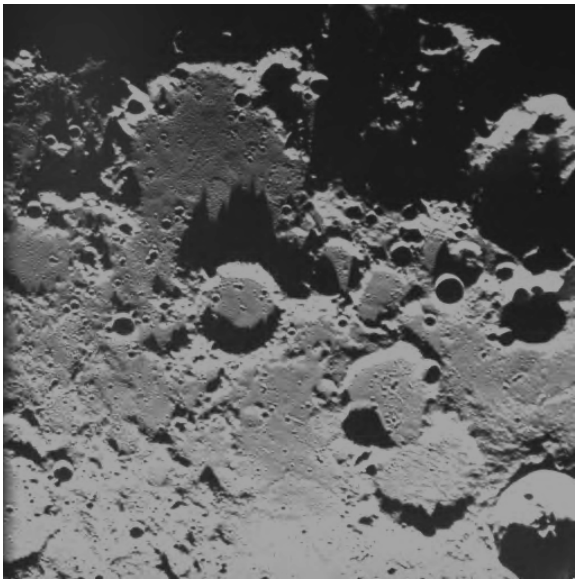

Fig.3: North polar view near Byrd crater (FOV 200 km)

Dedicated fixed polar pointings with long exposures have been made to search for shadowed or double-shadowed areas, and for potential 'water ice traps' or 'cold traps'.

We shall also describe other results obtained at the Moon.

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