AMIE ON SMART-1: A PRELIMINARY ANALYSIS OF COLOUR INFORMATION FROM IMAGES OF THE OPPENHEIMER REGION ON THE MOON. P. Cerroni,[1] M. C. De Sanctis[1], J.L. Josset[2] , S. Beauvivre[3] S. Besse[4] S. Chevrel[4] P. Pinet[4] D. Koschny[5] M. Almeida[5] A. Barucci[6] S. Erard[6] D. Despan[6], Y. Langevin[7] and the AMIE Team [1]IASF-INAF Area ricerca CNR Via Fosso del Cavaliere 00133 Roma Italy Priscilla.cerroni@iasf-roma.inaf.it, [2]Space Exploration Institute ,Case postale, CH-2002 Neuchâtel, Switzerland [3]Micro-cameras & Space Exploration , Jaquet-Droz 1, CH-2000 Neuchâtel, Switzerland, [4]UMR 5562 CNRS/GRGS Observatoire Midi-Pyrénées , 14, avenue Edouard Belin 31400 Toulouse, France, [5]ESA/ESTEC , Keplerlaan 1, 2201 Noordwijk, The Netherlands, [6]Observatoire Paris Meudon , Meudon , France, [7]IAS Bat. 121, 91405 Orsay, France

Introduction: The ESA mission to the Moon, SMART-1, ended on the 3rd of September with a fantastic impact close to the south of Mare Humorum.

The Advanced Moon micro-Imager Experiment (AMIE) [1] was the imaging system on board the ESA mission to the Moon SMART-1. During the time spent in lunar orbit AMIE provided high resolution CCD images of selected lunar areas where it performed colour imaging through three filters at 750, 915 and 960 nm.

The positions of the filters were optimised to allow discrimination between mafic minerals which dominate the mare (revealed by the Fe2+ absorption feature at 950 nm) and the anorthosite rich highland materials [2].

AMIE Data: Specific targets of the Southern and Northern Lunar emisphere were imaged in colour-mode by AMIE on SMART-1 respectively from October through December 2005 and from April through June 2006. In these time intervals the SMART-1 spacecraft was operating in push-broom mode: thus, the same region of the lunar surface was imaged in the three different spectral filters llowing colour information to be retrieved for that region through coregistration of the calibrated images.

In this work we present data from the well known Oppenheimer crater centered at 35.4 S, 194 E in the South Pole-Aitken basin. This Nectarian-aged crater (205 km diameter) presents a fracturated floor composed of Imbrian-Nectarian plains with seven pyroclastic deposits .

During the first pushbroom operation, AMIE acquired 2 sets of data inside the Oppenheimer crater. AMIE obtained in this region 3 sets of 3 colour images for the orbit 1558, located precisely in the center of the crater where there is no central peak and no pyroclastic deposits.

In this study, we will focus only data obtained during orbit 1558 (red box in Figure 1); the area imaged during SMART-1 previous orbit 1557 shown in the blue box in Figure 1 will not be addressed here.

Data Analysis and comparison with Clementine: A different approach to calibration has been applied here with respect to what described in [3]: data have been corrected by a flat field obtained by summing a large (~100) number of images. The data have then been co-registered to produce colour images and band-ratio images, as described in [3]. A preliminary assessment and a comparison with Clementine data for the same region is presented as a test.

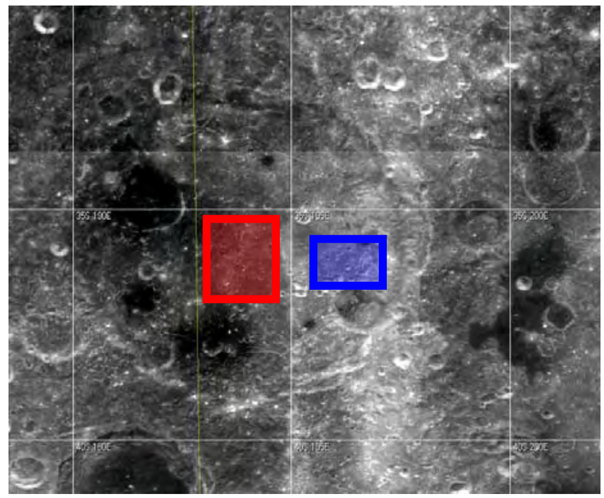


Figure 1. Clementine UVVIS color image of the region of the Oppenheimer crater centered at 35,4 S, 194 E. The two color boxes are images obtained by AMIE during two consecutive orbits: 1557 (blue) and 1558 (red) .

The colour image obtained after calibrating and co-registering the filters images is shown in Figure 2, where it is compared to the Clementine colour image for the same region.

Two different areas were identified in this image, the rim of a crater (identified by a red dot in figure 2) and the floor of Oppenheimer (identified by a green dot in the same image). Spectral profiles were obtained for these two regions and were compared with results from Clementine; this comparison is shown in Figures 3 and 4. The dynamic of the profiles in these figures was normalized to the band number 1, filter 750nm common to the Clementine and AMIE cameras. Band number 2 correponds to 915nm for AMIE and to 900nm for Clementine, band 3 is equal to 960nm and 950nm respectively for AMIE and Clementine.

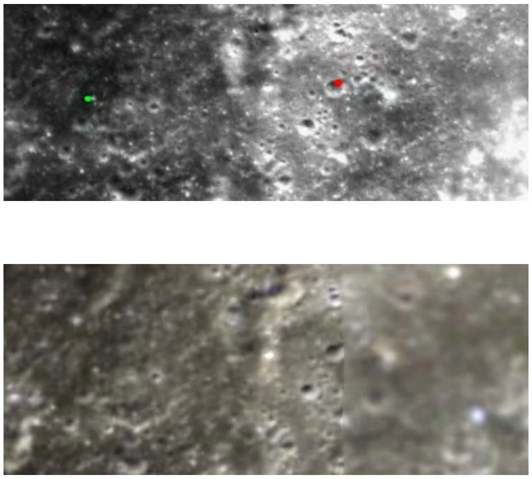
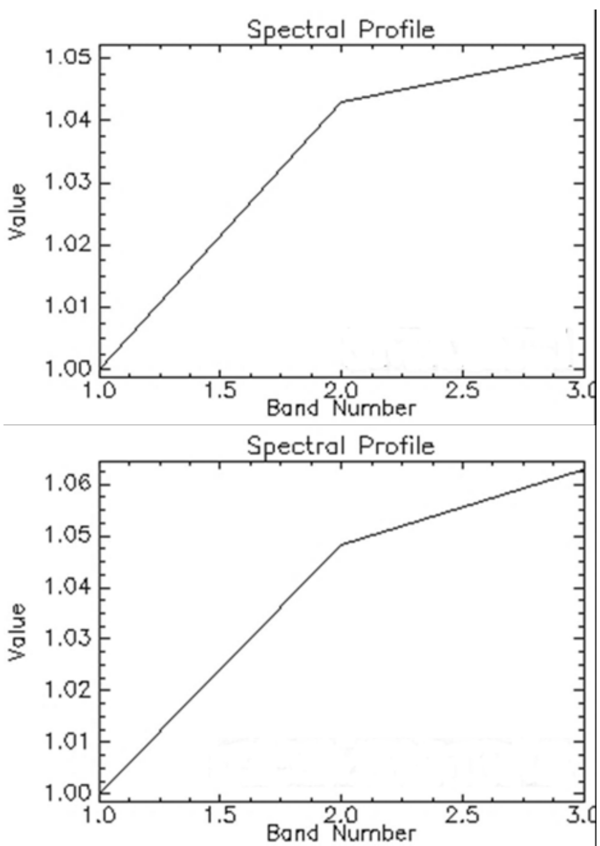


Figure 2 Registered images (3 channels) from the area of investigation of Oppenheimer crater from SMART-1 (top) and Clementine (bottom). Green and red dots are comparison areas discussed above.

Figure 3 Spectral profiles obtained by AMIE (top) and Clementine (bottom) for the crater rim identified by the red dot in Figure 2; spectra are normalized to 1 at 750 nm.



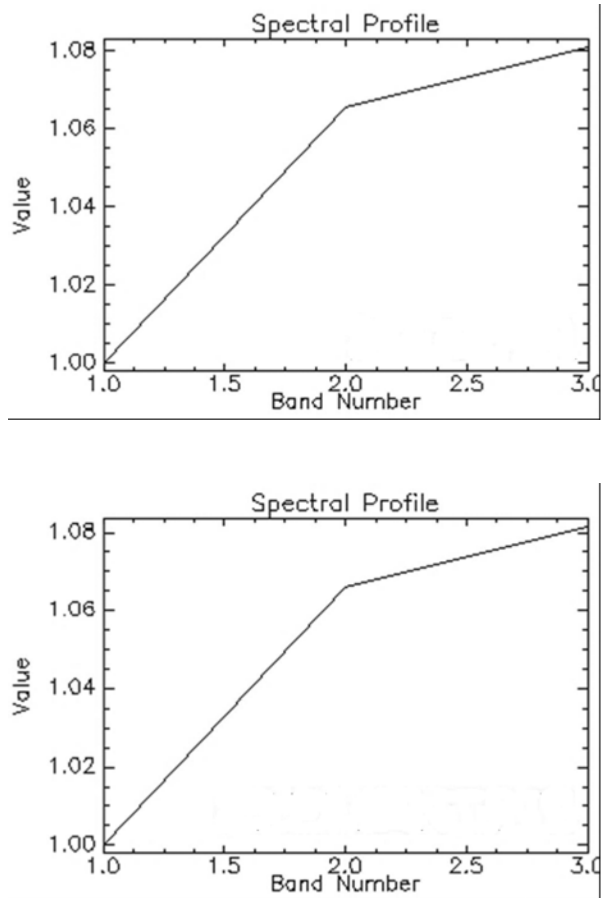


Figure 4 Spectral profiles obtained by AMIE (top) and Clementine (bottom) for the region of Oppenheimer floor identified by the green dot in Figure 2; spectra are normalized to 1 at 750 nm.

The spectra obtained by AMIE for the region of the rim of a crater (red dot in Figure 2) and for the floor of Oppenheimer (green dot in Figure 2) are shown in the top part of Figures 3 and 4 respectively, where they are compared with the spectral profiles of the same regions obtained by Clementine, shown in the bottom part of the figures: the spectral profiles are found to be remarkably similar.

Conclusions: AMIE data yield promising results for colour imaging of selected lunar regions; we plan to validate the approach described here by more extensive comparison with regions which are spectral standards for calibration, such as for example the Apollo 14 landing site, imaged in colour by AMIE during SMART1 second push-broom phase.

References: [1] Josset et al, (2006) Advances in Space Res 37, 14-20 [2] Pinet, P. et al. (2005) *PSS*, 53, 13091318 [3] P. Cerroni et al. *LPS XXXVII*, Abstract #1831 **Acknowledgements:** P. Cerroni and M. C. De Sanctis acknowledge the support given by ASI grant I/030/05/0