THE CURRENT AVALANCHE DEPOSITS IN LUNAR CRATER REINER: LRO DATA.
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Introduction: Processes of the space weathering on the Moon affect the optical properties of an exposed lunar soil. The main spectral/optical effects of space weathering are a reduction of reflectance, attenuation of the 1-µm ferrous absorption band, and a red-sloped continuum creation [1]. Lucey et al. [2 - 4] proposed to
estimate the maturity of lunar soils from Clementine UVVIS data using a method which decorrelates the effects of variations in Fe^{2+} concentration from the effects of soil maturity. The method calculates optical maturity defined as parameter OMAT [5]. Pinet et al. [6] used the method to analyse the "Reiner-γ – Reiner" region on the basis of Clementine spectral image data.

Spectral analyses of the crater Reiner: Crater Reiner is located in western Oceanus Procellarum. Diameter of the crater is 30 km, its depth is 2.4 km and its central peak height is about 700 m. Topographic data is showing that general slope of the western part of the inner walls is about 20º. There is a terrace on the western wall slope. Slope of the eastern crater inner wall is in range 17° – 18° [7].

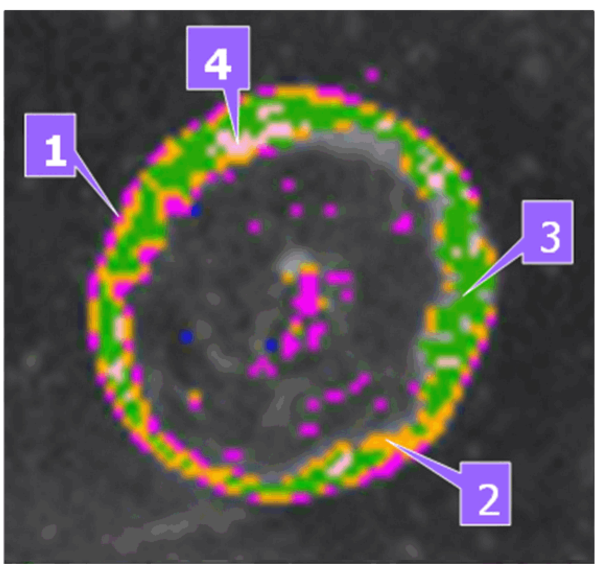

Fig.1

The diagram, depicted plots Lucey's parameters (Fe content in weight % versus maturity index OMAT), was constructed. The spatial distribution associated to the color scale coded boxes (1 to 4) displayed in fig. 1. It reveals the presence of extremely immature soils (coded in color box 4) at the hundred meters scale in the crater Reiner area. Also the soil iron content in the regions is higher (up to 16%) than in the surrounding mare background soils (about 11- 12%). Immature soils (coded in green, box 3) occupy most areas of the inner wall slopes of the crater. Extremely immature materials (coded in light grey, box 4) are observed in the north-north-western part of the inner walls.

Interpretation: Four LROC images of the region were used to interpret immature of different areas of the slope avalanche deposits in crater Reiner. Fig. 2 shows combination image of spectral view (Fig. 1) and LROC images (2009: 1, 2 – M116676622L/R. 3, 4 – M109596500L/R, http://wms.lroc.asu.edu/lroc/).

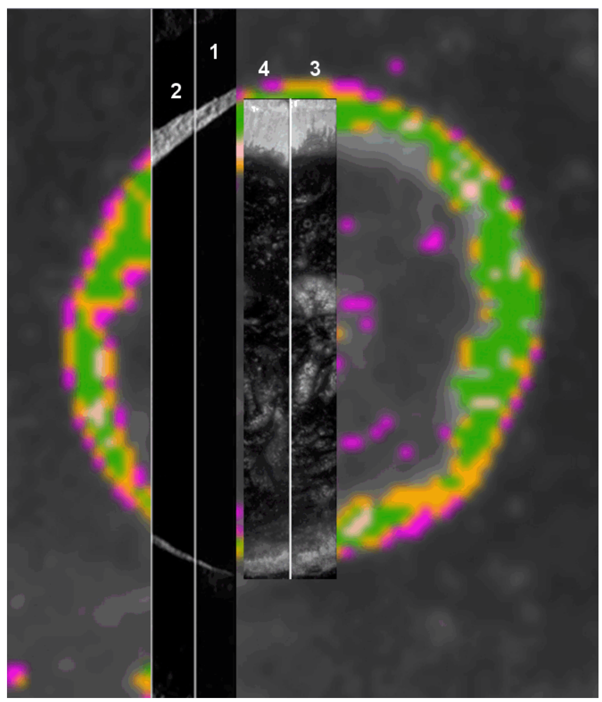

Fig. 2

Evidence of avalanching and of other downslope movement of material is clearly visible on the inner walls of the crater now. In general, freshly exposed lunar material is brighter than undisturbed materials nearby. The brightness of the avalanche scars is an numerous bright avalanche deposits on the steep crater walls, apparently originating at outcrop ledges near the top of the wall. On the western wall, most avalanches stop in a moat at the base of the wall (near terraces). On the eastern wall, avalanches extend out onto the irregular, inward-sloping floor. Extremely immature soils coded in color box 4 reveal near part of northern slope of the crater Reiner wall. Fig. 3 show fragment of avalanche deposit coded in color box 4 on 0,762 m by width with resolution about 0,51 m/pixel (Fig. 3).

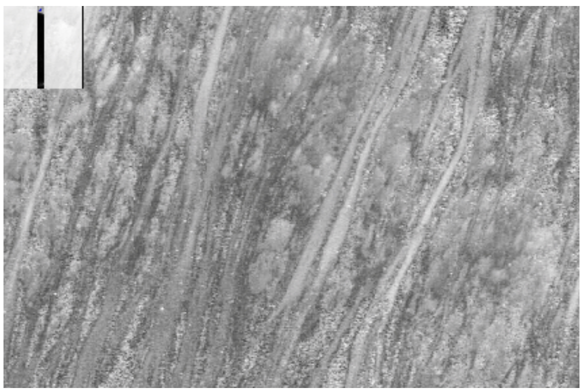

Fig. 3

The spectral influence of both the soil maturity and iron content is quantified according to Lucey's method [2] and our previous analyses, based on the independent spectropolarization method [8, 9], provide with soil maturity estimates in good agreement with the present results. The local OMAT estimates points out at the occurrence of slope instability processes. Also, we note that the iron content estimates of these slope soils reach locally maximal values of 16%, with a systematic increase of Fe content with regolith depth for the investigated region.

Fig, 4

Using similar Clementine data for other lunar regions of mare and highland types, we obtain a scale of conformity between OMAT, Is/FeO (by Morris [10]) and spectropolarimetric maturity indexes [9]. Fig. 4 shows view of surface that is typical for immature soils coded in green, box 3. Fig. 5 shows morphological type and immature surface coded in color box 2.

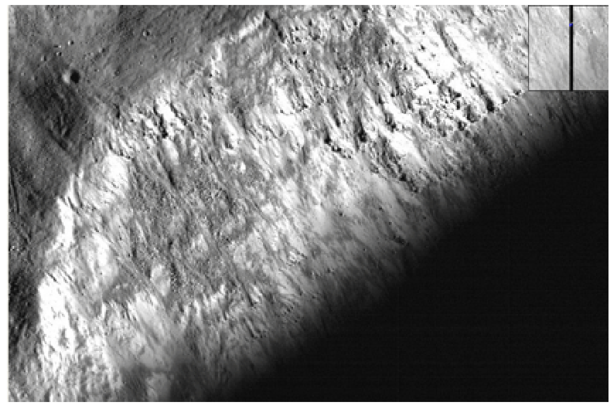

Fig. 5

The maturity index values ranging from box 2 to box 4 correspond to exposure age from 6 to 0.5 million years [9].

Conclusions: Avalanching appears to be a majormeans of the current erosion on steep lunar slopes. Many features of the surface structures occur where the wall is bowed outward and probably represent slump deposits where portions of the crater wall have collapsed into the crater. Soil inner friction angle is not more than 20^o for upper layer matter. Bulk density of the surface soil is about 1.5 g/cm^3 in the case. The age of the observed lunar slope degradation is very young. It's possible the process is present.

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