Use of lunar spectra for space weathering study

K. Chrbolková[1,2], T. Kohout[1] and J. Ďurech[2]

[1]*Department of Physics, University of Helsinki, Gustaf Hällströmin katu 2a, 00560 Helsinki, Finland.*

[2]*Astronomical Institute of Charles University, V Holešovičkách 2, 180 00 Prague 8, Czech Republic.*

We will present our approach to the analysis of lunar spectra taken by M3 spectrometer on board Chandrayaan-1 spacecraft. These spectra are used for the study of space weathering trends. Space weathering refers to continual changes of spectral and compositional properties of surfaces of airless planetary bodies. Main changes are in the albedo, spectral slope and depth of silicate absorption bands.

The studied spectra span over following wavelengths: 540 nm – 2980 nm. Therefore, they cover two important absorption bands at 1000 and 2000 nm, referring to olivine and pyroxene absorptions. The goal of ours is to compare spectra taken in fresh (unweathered) areas with the mature ones. The comparison is on the level of the three mentioned characteristics (albedo, band depth and spectral slope). We use modification of Modified Gaussian Model (MGM) by Sunshine et al. (1999) to estimate these characteristics for the 1000 and 200 nm bands. An example spectra can be seen in Figure 1. M3 measured the green points, MGM iterates to get the smallest root mean square error (purple) between the fit (black) and the data. Overall fit is composed of the fitted absorption bands that are modeled by Gaussian curves (blue) and the continuum curve (red), modeled as a second order polynomial in our case.

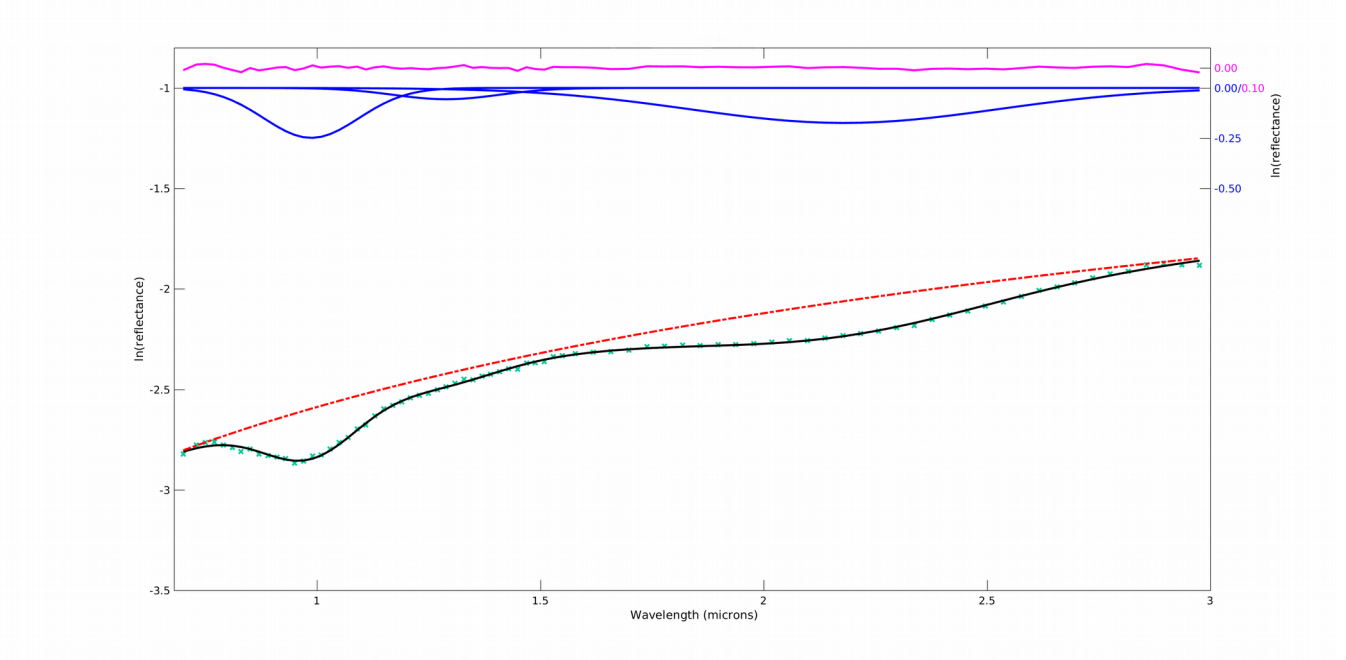

Fig. 1: Example of the lunar spectra (green points), and its fit in MGM: continuum (red), individual absorption bands (blue), root mean square (purple), overall fit (black).

References:

Sunshine et al. (1999). Absorption band modelling in reflectance spectra: Availability of the modified gaussian model. Lunar and Planetary Science Conference 30. 1306.