SELENE (Kaguya) Spectra of Small Lunar Craters

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This PDS data set contains the spectra and analytical products presented in Lucey et al. 2014. The spectra are derived from the SELENE Spectral Profiler and represent 8183 spectra of small immature craters. The data file (smcrat_spectra.csv) has 165 columns and 8184 rows. The first 12 columns are descriptive data, and columns 13 through 165 are the photometrically corrected Spectral Profiler spectra of the small craters. At the time of the production of the paper, the valid data range was 0.5 and 1.6 microns. Redundant data channels have been removed and the wavelength data are monotonically increasing. Invalid data are assigned a value of -99.

The mineral data included in the first 12 columns were extracted from a large lookup table computed from a radiative transfer model described in Lucey et al. 2014. In that lookup table the mineral chemistry and grain size was fixed, and the space weathering parameters (submicroscopic iron and microphase iron) were quantized to conserve run time on the model. The spectra were selected to be immature so only a small number of low values were selected by the optimization algorithm.

The models that provide the mineral abundance estimates were all run with a grain size of 17 microns, and an Mg-number of 65. The abundances of the two sizes of submicroscopic iron were linked by this equation:

$$SMFe_{1\,\mu m,wt.\,fraction} = 0.00225 \times SMFe_{<300\,nm,PPT} - 0.00025 \times SMFe^2_{<300\,nm,PPT}$$

The submicroscopic iron at 1 micron diameter input values were = 1,2,3,4,5,6 and 7 mg/g into the spectrum library lookup table.

Models were allowed to return negative values. Based on tests of synthetic noisy data, allowing the models to include negative values up to 5 wt% caused averages of zero abundance constituents to have means near zero. Limiting the data to non-negative values causes overestimates of low abundances species in averages of data.

The first row of the file contains the column headings. The first 3 columns are the latitude, longitude and SELENE revolution number from which each spectrum was derived. The fourth column is a flag that indicates a single spectrum for a crater (0) or is one of several sequential spectra of a crater (1). The fifth column is the FeO content determined from the spectrum using the algorithm of Lawrence et al. 2000. The sixth column is the optical maturity parameter OMAT from Lucey et al. 2000. Columns 7 through 12 are the result of fitting each spectrum with a radiative transfer model described in Lucey et al. 2014. The columns are:

1) Latitude

2) Longitude

3) Kaguya revolution number

4) Single or multiple observation flag

5) FeO content

6) OMAT

7) Olivine (wt. %)

8) Low calcium pyroxene (wt. %)

9) High calcium pyroxene (wt. %)

10) Plagioclase (wt. %)

11) Submicroscopic iron (1 micron diameter) (Wt. fraction)

12) Submicroscopic iron (< 300 nm diameter) (mg/g)

Column headings 13-165 are the wavelengths of the spectral channels used in the analysis.

The following two figures are examples of plots of selected spectra.

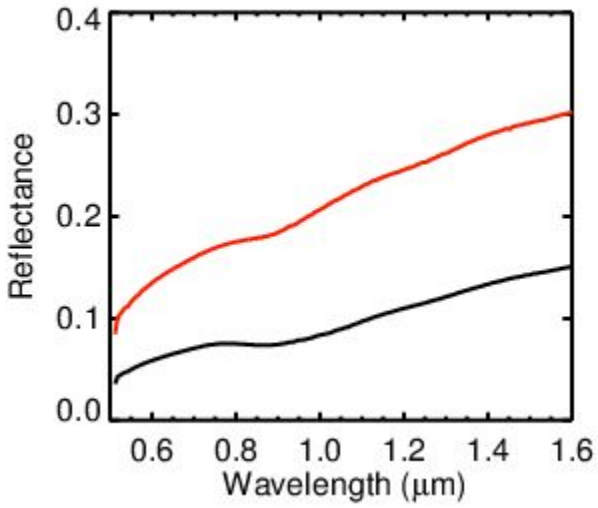

Figure 1. Average spectra from the data base of the Feldspathic Highlands Terrane (red) and the South-Pole Aitken Terrain (black).

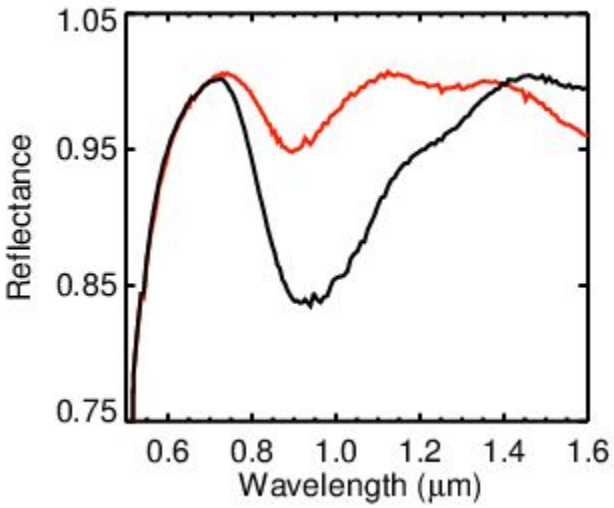


Figure 2. Average spectra from the data base with continua removed of the Feldspathic Highlands Terrane (red) and the South-Pole Aitken Terrain (black).