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Mapping the spatial distribution, mineralogy, and geochemistry of lunar highlands spectral types

J. T. Cahill, P. G. Lucey, and J. J. Gillis-Davis

HIGP, University of Hawaii at Manoa, Honolulu, HI 96822, USA (jcahill@higp.hawaii.edu)

Knowledge of lunar surface mineralogy and chemistry is central to understanding lunar crustal evolution. Using the UVVIS Clementine data set, *Tompkins and Pieters* (1999) showed that the approximate compositional diversity of assumed immature lunar crustal material could be determined. Here we build upon their study by considering several aspects that remain unanswered. These aspects include: (1) surface maturity, (2) spectral-type distribution, (3) quantitative determination of spectral-type mineralogy, and (4) FeO and Mg#.

To date, we have analyzed 12 regions previously studied by *Tompkins and Pieters* (1999). As an example we present the case of Bhabha impact crater (Lat: 55.5˚ S Lon: 195˚). In *Tompkins and Pieters* (1999) Bhabha crater was characterized with material consistent with the spectral classes GN, G, AN, and AGN. Using a correlation algorithm detailed by *Clark et al.* (2003) we find that spectral classes that correlate with Bhabha spectra to a $>$99% accuracy and have OMAT values of $\geq$ 0.3 (immature) include the spectral types N, GN, G, AN, AGN, and AG (*Lucey et al.*, 2000).

Clementine spectra that correlated with a spectral class were averaged and used to calculate mean FeO, maturity, Mg#, and mineralogy using a radiative transfer model based upon work by *Hapke* (1981; 1993; 2001) and *Lucey* (1998). Mineralogic analyses indicate that all regions studied in Bhabha are quite mafic, with less plagioclase for the classes beginning with "A" than suggested by *Tompkins and Pieters* (1999). However, these classes do plot with more plagioclase than their mafic counterparts.

Maps detailing the spatial distribution of spectral classes within all craters studied were also created. These maps show that areas identified as GNTA1 or 2 are not associated with crater central peaks. Furthermore, OMAT values calculated for these areas are $<$0.3 (mature).