Mare basalts in the southern nearside of the moon interpreted from Clementine UV/VIS data

Shinsuke Kodama[1], Yasushi Yamaguchi[1]

[1] Earth and Planetary Sci., Nagoya Univ

http://sys.eps.nagoya-u.ac.jp

Mare basalts on the moon are important surface manifestation to understand the thermal history and compositional structure of the moon interior. Clementine UV/VIS multispectral data were used to map the mare deposits in Mare Humorum including the Herigonius region on the north of the Humorum Basin in order to know the volcanic history of the southwestern part of the lunar nearside. Firstly, boundaries of mare units were drawn by visual interpretation of albedo and false color composite images, in which band ratios of R750/R415, R750/R950, and R415/R750 are assigned to red, green, and blue, respectively. Then, the mare units were characterized by spectral parameters (albedo, UV/VIS ratio, 1um band absorption) and the iron and titanium contents derived from the technique proposed by Lucey et al. (2000). The stratigraphic sequence was constructed based upon the unit boundary shapes and chemistry of crater ejecta materials, which were excavated from underlying units by impact.

The mare deposits were classified into 5 groups mainly based upon their titanium contents and signature of 1um band absorption. In general the unit boundaries defined in this study are in good agreement with those of previous works (e.g. Pieters et al., 1975; Hiesinger et al., 2000). Spectrally blue mare unit with the highest titanium content (higher than 9 wt.% TiO2) is distributed in the northern portion of the Humorum Basin and Herigonius region, and is stratigraphycally the youngest in this region. Less bluer basalts with intermediate titanium contents (5-9 wt.% TiO2) occupy the center of Humorum Basin and the eastern part of Herigonius region. Redder low-Ti basalts (less than 5 wt.% TiO2) are distributed near the southwestern and southeastern margins, and are probably older than the titanium-richer basalts in the central portion. The titanium-richer mare basalts in the central and northern portions also have higher iron content (higher than 18 wt.% FeO). In contrast, the lower-Ti basalts near the mare margin have lower iron content (less than 18 wt.% FeO). A dark mantling deposit (DMD) was found at the southwestern margin of the mare, and was judged as the oldest unit in this region. The spectra of the DMD materials appear red, suggests that these are compositionally distinct from those of Serenitatis in the eastern nearside of the moon. As a result of stratigraphic correlation in the study area, we can conclude that the titanium content increases with time. This result is different from Greeley and Spudis (1978), who insisted that the intermediate-Ti basalt is younger than the high-Ti basalts in the Herigonius region. Further investigation is needed to confirm our result. In addition to Mare Humorum, we are currently analyzing mare basalts in Mare Insularum, Mare Cognitum, and Mare Nubium in order to reveal the volcanic history of these maria.