Lithologic mapping of the lunar central peak's rock types with Clementine data and verification of the rock classification method

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In this study, the lithologic maps for central peak craters ware made from Clementine UVVIS camera 5bands data by the method of Tompkins and Pieters (1999). To confirm whether the lunar central peak material is related to the lower crust or not, the spectra of mafic area ware examined.including impact crater's pixels. Some good candidates for the landing site in the future Japanese Lunar mission were also picked up.

The lunar craters range in diameter from 40 to 180 km are believed to have exhumed material from 5-30 km beneath the surface to form the central peaks including both upper and lower crustal rocks. Therefore, the craters having the central peaks are one of the best candidate for the landing site in the future japanese lunar mission.

The central peaks of 109 impact craters across the Moon were picked up by Tompkins and Pieters (1999). The lithology of them was crassified into 11 rock types using spectral parameters; key ratio and spectral curvature. Key ratio indicates the depth of Fe2+ absorption band. The lower Key ratio indicates the more abundant mafic mineral. Spectral curvature is parameter to distinguish among low-Ca pyroxen, high-Ca pyroxene, and olivine by spectral shape.

In this study, the lithologic maps of 10 rock types (except for Anorthositic Troctolite) for 109 central peak craters were made using Akita-View that is image processing software for Clementine UVVIS multispectral image. The central peaks including possible Olivine bearing lithologies were picked up using 950 nm/1000 nm image. Then, we examined whether the lunar central peak material is related to the lower crust or not, by the spectra of pixels indicating mafic lithologies.

If the reflectance dose not change by the changed of incident light intensity, the difference in incident light intensity caused by the topography of the area and the position of the sun do not influence on the classification of rock types.

Influence of quenched glass phase was examined with Dark ring area. Dark ring area is the area covered by quenched glass of impact melt around crater. It has high R750/R415 value and higher reflectance at 900, 950, and 1000 nm than these surrounding area. Accordingly, increasing Key ratio and decreasing mafic concentration cause more Anorthositic.

Fresh craters in Copernican System (1Ga to present) were examined. The crater of the larger diameter have the more mafic central peak lithologies.

From these results, it can be said that the presence of mafic lithologies at the central peaks were worth believing.

Basalt area is classified into Gabbroic Noritic Troctolitic Anorthosite or Anorthositic Gabbronorite by the method of Tompkins and Pieters (1999). It is confirmed that the spectral shape of basalt becomes an analogue of Anorthosite with minor mafic minerals by weathering.

Some good candidates for landing site were picked up. Stevinus, Tycho, Aristillus and Zucchius are suitable for finding lower crust materials. Crookes is suitable for finding olivine bearing lithologies.