SPECTRAL ANALYSIS OF VOLCANIC FEATURES IN AITKEN CRATER ON LUNAR FARSIDE. T. Takata, Geological Inst., U. Tokyo (Hongo, 7-3-1, Bunkyo, Tokyo 113 JAPAN, toshiko@geol.s.u-tokyo.ac.jp).

Clementine UVVIS multispectral image data in the region of Aitken crater is analyzed, as the first step to investigate the diversity of mare materials on the lunar farside, especially, materials of approximately 50 maria in South Pole-Aitken (SPA) basin. Typical mare basalt and less ferrous domes are confirmed in Aitken crater from the spectral data, although the restriction of the small number of channels is inevitable. Further lithologic investigate of craters accompanied with maria in SPA basin could provide the diversity of mare materials not only within the SPA basin, but on the global surface of the moon.

Volcanic materials, particularly, mare materials are key to understand the evolution of the secondary crust in the lunar history. Lunar maria cover 17 % of the area of lunar surface, whereas, only 5 % of the area exist on the farside [1]. Most of them are distributed in craters in South Pole-Aitken (SPA) basin and approximately 50 maria exist in the basin [2]. Detailed pre-Clementine data analysis suggested that most of the maria in SPA basin can be characterized by single eruptive phases at Imbrian age [2]. However, it contradicts the observational fact that several phases of lava explosions resulted from various magma sources exist in mare formation on the lunar nearside [3].

One of the effective means to understand the diversity of the evolution of the secondary crust is lithologic investigate of the lunar maria. Clementine multispectral image data is the unique lithologic data set of the global farside coverage [4]. As the first step to understand the lithologic diversity of the maria on the farside, the interior of Aitken crater is investigated using Clementine UV/VIS image data.

Aitken Crater is located at 174 E. and 17 S., at the northern edge of SPA basin. The diameter is 120 km and it is a typical central peak- and peak ring- craters accompanied with mare in SPA basin. Aitken crater was photographed by Apollo 17 metric camera and the geologic setting was investigated in detail (fig. 1) [5]. Mare material fills in the southern half of the crater, and domes, which are probably volcanic, and central peaks exit in the crater.

The method of Clementine data analysis follows Pieters et al. [6]. Calibration method of Clementine image data [7] is applied to images of the region extracted from distributed Clementine CDROM. All the pixel values are transferred to bidirectional reflectance. Calibrated mosaic images of reflectance at 415 / 750 / 950 nm wavelengths are created (fig. 2) and spectral variations with 5 channels (415 / 750 / 900 / 950 / 1000 nm) are compared in characteristic geologic locations of the crater (fig. 3). Especially, mosaic images and spectra provide distribution of materials and the lithology of the materials, respectively.

Fig. 2 shows mosaic image of the ratio of reflectance at 750 nm relative to reflectance at 950 nm in the region of Aitken crater. The ratio indicates the depth of the ferrous absorption band at 900 - 1000 nm or the degree of weathering [6]. The southern region filled with mare basalt is shown by bright area in fig. 2, as seen dark in the Apollo photograph. Domes located at the north-east in the Aitken crater is relatively darker, and it indicates less mafic materials. The result consists with the shapes of the volcanic deposit. The characteristics is also indicated in the 950 nm- absorption features in fig. 3. Spectra of bright swirl patterns observed in the mare region also have absorption at 950 nm. The material can be similar to mare basalt, although relatively new geologic event, e.g., excavation by ejecta from other large impact craters, may result in the higher albedo of swirl patterns. Central peaks are typical anorthotic. This is also consistent with the geodesic result reported by Zuber et al., i.e., crustal thickness of 50 - 100 km in this region [8].

Conclusion:
Clementine multispectral image data in the region of Aitken crater is analyzed, as the first step to investigate the diversity of mare material on the lunar farside, especially, in SPA basin. Typical mare basalt and less ferrous domes are confirmed from spectral data. Although the restriction of the small number of channels is inevitable, further lithologic

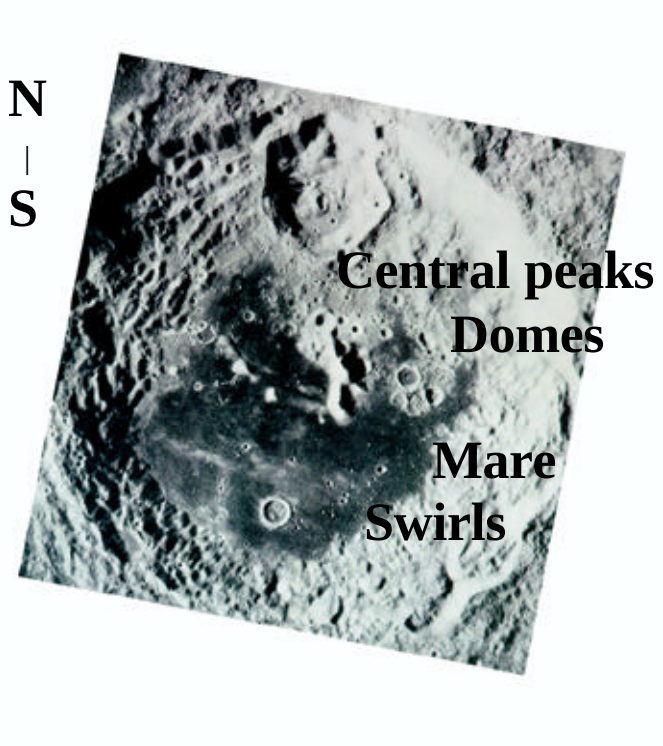

Fig. 1. Aitken crater photographed by Apollo 17 metric camera (from AS17-0481). Diameter is 120 km. Image is rotated so that the northern direction is up.

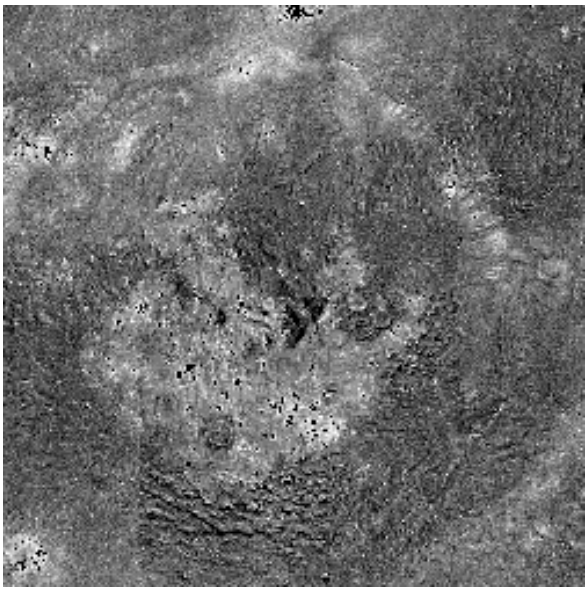

Fig.2. Mosaic image of the ratio of reflectance at 750 nm relative to reflectance at 950 nm in the region of Aitken crater. The area between 171-176 E. and 14-19 S. is shown in cylindrical projection.

investigate of craters accompanied with maria in SPA basin could provide the comparison and the diversity of mare materials not only within the SPA basin, but on the global surface.

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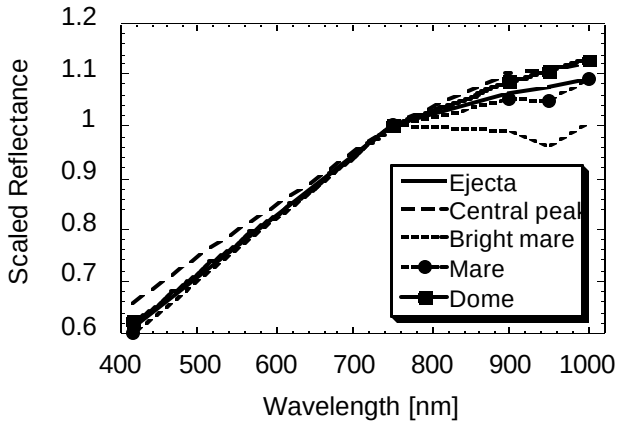

Fig. 3. Spectra with 5 channels for several characteristic locations in Aitken crater, such as, mare area, bright mare area (swirl patterns), central peaks, domes, and the ejecta of the crater, are shown. Reflectance is scaled by the value at 750 nm.