STUDY OF CHEMICAL EVOLUTION OF LAVA FLOWS IN MARE SERENITATIS USING HYPER SPECTRAL DATA.

K. Saiki and H. Okuno. Department of Earth and Space Science, Graduate School of Science, Osaka University, Osaka, Japan. E-mail: ksaiki@ess.sci.osaka-u.ac.jp

Introduction: Mg-number (Mg# = atomic Mg/(Mg+Fe)) serves as an important petrologic discriminator when analyzing and understanding lunar rocks. Mg-number variation shifts the wavelength of the absorption spectra of ferrous iron with their peaks at around 1000 nm and 2000 nm. The shift had, however, not been detected by remote sensing because it is limited to a very small spectral range. In order to detect this slight shift, ground-based observations of the moon were carried out and the absorption-peak map of Mare Serenitatis has been made [1]. Using this map, we tried to interpret the chemical evolution process of some characteristic lava flows in Mare Serenitatis.

Methods: The spectral data of the lunar surface was obtained by Advanced Lunar Imaging Spectrometer (ALIS) [2]. ALIS is a hyper-spectral telescope using a prism-grating-prism device. The location of the observation was Science City at the peak of Mt. Haleakala, Maui, Hawaii, USA. The obtained image cubes of the moon were processed by the following steps; (1) dark and flat field correction, (2) normalization of all mare spectra with the same standard highland spectrum, (3) baseline correction with line which starts from 693 nm and ends at 1059 nm. Comparing the resultant spectra, we detected the slight shift of the absorption spectra of ferrous iron and absorption-peak map of Mare Serenitatis was made. FeO and TiO_2 maps of Mare Serenitatis were made from Clementine UVVIS image cubes using Lucey's algorithm [3]. Lava flow units were identified based on Kodamas' geological map [4].

Results: In two lava flow units on Mare Serenitatis, notable shifts of the absorption spectra of ferrous iron at around 1000 nm were detected. One is in Sr4 and another is in Sr5 lava of Kodamas' classification [4]. The northern part of Sr4 and the western part of Sr5 have the absorption peak with shorter wavelength and the southern part of Sr4 and the eastern part of Sr5 have the peak with longer wavelength. FeO content of Sr4 lava changes from 15 to 17 wt % from north to south, while there is no obvious change in FeO content within Sr5. TiO_2 contents are almost constant within these lava flows.

Discussion: If two areas with shorter wavelength of absorption peak locating Sr4 and Sr5 have Mg-rich lithology, it leads two interpretations. One is that the shift is caused by the difference of the degree of partial melting of parent rock. The lavas of high Mg# areas may be higher degree partial melt in the latter stage. Another is that the variation is caused by the difference of the degree of magma differentiation after eruption. Mg# would be expected to decrease along the flow line as pyroxene and olivine with higher Mg # crystallized and were removed from the melt. The latter case may have advantage in maintaining FeO content. In both cases, the high Mg# area indicates the presence of a vent.

References: [1] Okuno H. et al. 2008. *Earth Planets and Space* 60:425-431. [2] Saiki K. et al. 2004. Abstract #148. 35th Lunar & Planetary Science Conference. [3] Lucey P. G. and Blewett D. T. 2000. *Journal of Geophysical Research* 105:20297-20305. [4] Kodama S. and Yamaguchi Y. 2003. *Meteoritics & Planetary Science* 38:1461-1484.