

The accumulation ages of subsurface layer in Mare Imbrium based on the SELENE observation data

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Lunar Radar Sounder (LRS) onboard SELENE succeeded in detecting the electromagnetic wave reflected at subsurface layer in low-titanium regions [Ono et al., 2009; Pommerol et al., 2010]. Multiband Imager (MI) and Terrain Camera (TC) onboard SELENE respectively investigated the lunar surface composition [e.g., Otake et al., 2012] and the eruption ages of lunar lava flows [e.g., Morota et al., 2011]. Besides, the studies combined the LRS, MI, and TC data revealed the subsurface structure around the impact crater [Oshigami et al., 2012], and suggests the brittle subsurface layer with a high-porosity [Ishiyama et al., 2013]. This study investigates the accumulated age of subsurface layer in lava flow units (Unit 12 and 8 [Bugiolacchi and Guest, 2008]) in the north Mare Imbrium. This investigation is significant for discussing lunar volcanic activity because we can estimate a eruption rate of lunar lava flow.

We identified three subsurface echoes under Unit 8 from the LRS data, and revealed that the margin of the deepest subsurface echo was consistent with the surface boundary between Unit 12 and Unit 8; Unit 8 is accumulated on Unit 12. These ages of the units were estimated to be 3.31 ± 0.19 Ga [Bugiolacchi and Guest, 2008]. However, the previous study estimated these ages by using a lunar map data with a low spatial resolution (60 – 150 m/pixel). This low spatial resolution data causes a large error for estimating the age. Thus, this study used the lunar high-resolution ortho map data obtained from TC, which has 10 m/pixel. The age of Unit 12 was estimated to be ~ 3.6 Ga, which was older than the age of Unit 8. This result is consistent with the order of the stratification identified from the LRS data.

In addition, we identified that Unit 8 can be divided into several units by using the plagioclase, FeO, and TiO₂ Map data, produced from the MI data. We investigate the correspondence relationship between the subsurface echoes and the identified units, and then the history of lunar volcanic activity will be discussed in the presentation.