[EJ] Evening Poster | P (Space and Planetary Sciences) | P-PS Planetary Sciences

[P-PS05]Lunar science and exploration

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Scientific data sets acquired by not only Japanese lunar mission SELENE (Kaguya), but also other countries' missions, have become new standard for lunar science. Analyses of these data have been providing several new knowledge and changing some hypotheses into the truth of the Moon. In concurrence with these studies, some countries including Japan are planning future lunar missions. In this session, we will discuss scientific results based on newly acquired lunar data, strategy for future missions including SLIM, and theoretical and experimental studies for lunar science.

[PPS05-P02]Formation of Smythii basin based on the iSALE code

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The Smythii basin is located on the boundary between the lunar nearside and farside (1.3°N, 87.5°E), and is formed in Pre-Nectarian (~3.92 Ga ago) [Hiesinger et al., 2010]. Spudis [1993] reported that the Smythii basin has five ring structures, but most of which are ambiguous based on the latest lunar topography data. The clear rings are ~260 km and ~500 km in radius, and the latter is the main ring. The size of impactor and the lunar geothermal gradient depends on the ring structure and the size of basin [e.g., Potter et al., 2012; Potter et al., 2013]. From the comparison of toporaphies between Smythii and Orientale basin [e.g., Solomon and Head, 1980], the depth of Smythii basin has at least ~4.5 km. The crustal thickness around the Smythii basin is ~40 to 60 km based on the SELENE gravitational field observation [Ishihara et al., 2009]. However, the impact condition of the Smythii basin has not been understood. This study investigated the condition of the Smythii basin (~500 km in radius and 4.5 km in depth) by using a two-dimensional impact simulation code (2D-iSALE) [Amsden et al., 1980; Ivanov et al., 1997; Wünnemann et al., 2006].

The calculation domain of iSALE is the grid of 1 km/cell, 450 km along *x*-axis, and 250 km along *y*-axis. The areas of vacuum (100 km), crust (60 km), and mantle (90 km) are assumed along *y*-axis. The crust is basalt, and the mantle is dunite. The material of impactor is dunite, the impact speed is 21 km/s [Gomes et al., 2005], and the diameters are 10, 20, and 30 km. The other parameters were based on Miljković et al. [2013]. The geothermal gradients are 10, 20, 30, and 40 K/km. The surface temperature is 300 K, and this study assumed that the convection occurs at temperature more than 1300 K [e.g., Freed et al., 2014]. The calculation time was up to 2 hours from the basin formation.

This study confirmed that the radius and depth of the basin increased with the increase of the impactor’s diameter. In addition, when the geothermal gradient increased, the radius of basin increased and the depth of basin became shallow. In particular, the geological condition of Smythii basin (i.e., ~500 km in radius and 4.5 km in depth) could be explained when the geothermal gradient was more than 20 K/km and the impactor’s diameter was more than 30 km. This impact condition would be useful for understanding lunar thermal evolution. In the presentation, the recent progress will be reported.