AMOUNT AND DISTRIBUTION OF IMPACT MELT OF LARGE LUNAR CRATERS: VIEWS FROM LISM/KAGUYA. N. Hirata[1], J. Haruyama[2], M. Ohtake[2], T. Matsunaga[3], Y. Yokota[2], T. Morota[2], C. Honda[2], Y. Ogawa[3], M. Torii[2], T. Sugihara[4], H. Miyamoto[5], H. Demura[1], and N. Asada[1], [1]The University of Aizu, Ikki-machi, Aizu-Wakamatsu, Fukushima, 965-8580, JAPAN, [2]The Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, [3]National Institute for Environmental Studies, [4]Center for Deep Earth exploration, Japan Agency for Marine-Science and Technology, [5]The University Museum, The University of Tokyo. Corresponding author's e-mail address: naru@u-aizu.ac.jp

Introduction: Various features outside/inside of craters give important clues to reconstruct and understand impact cratering. Large and fresh lunar craters are best targets for such investigations, because only space weathering and limited degradations by small impacts are major processes that disturb original structures of ejecta units. Lunar Imager/Spectrometer (LISM), which onboard the Kaguya (SELENE) lunar explorer, will provide high-resolution and multi-spectral mapping data of the Moon [1-3]. Combination of high-resolution images, digital terrain models, multiband images, and spectral profiles is a complete set for geologic mapping of a crater and its surroundings. The purpose of this study is to make morphological analyses of those craters with the data from LISM and to reveal details of impact cratering processes. In this report, we concentrate on the amount and distribution of impact melt of lunar craters.

Impact Melt: Impact melt is a product of high temperature condition at the contact and compression stage of impact cratering. An amount of impact melt gives clues to a scale of an impact, the impactor size and the impact velocity. Field researches on terrestrial craters give constraints on model estimations of the amounts of impact melt [4], because thick melt sheets are preserved within terrestrial craters. Since erosive processes are limited on the lunar surface, impact melts of lunar craters remain not only as melt sheets within a cavity but also as small melt deposits within or around a cavity, and as glassy materials. As impact melt glasses spread around a rim of a crater, they are observed as dark rings in Clementine UVVIS images. We have already demonstrated that the total amount of impact melt could be estimated from multi-spectral images [5]. Images from LISM will give better constraints than previous studies. Extent of melt deposits, which have not been considered in the previous study, can be investigated with high-resolution images. Extent of a dark ring will be clearer in high-resolution images, and glass contents of dark ring materials will be able to estimate with spectroscopic data.

After its production, melted materials are transported with other ejecta during cratering process. Thus, final distribution of impact melt deposits around a crater reflects individual characteristics of its formation process. One important factor is an obliqueness of the impact. Distributions of dark rings are obviously affected by impact obliqueness [5]. It is suggested that the distribution of the melt ponds around the crater Tycho are controlled by the oblique impact [6].

Results on Jackson (D = 71 km): We pick up several target craters of our study [7]. Jackson is one of those targets that LISM images are currently available. It is a typical fresh crater on the lunar farside. Jackson has a bright ray system with a large forbidden zone in the NW sector and two minor ones in both S and SE sectors. This appearance suggests that Jackson was formed by an oblique impact of the NW-SE direction.

Impact melt ponds. The ponds on the ejecta blanket show a heterogeneous distribution, whereas the ponds on the terrace zone do not. There are few small ponds in the uprange (NW-N-NNE) sector. The ponds in the downrange (SE) sector and the side (S-SW) sector are large, and their number density is also high. The ponds in the side range (S-SW) seem to be larger than those in the downrange.

Impact melt sheet. Crater floor is mostly filled with a large sheet of impact melt. The uprange half of the floor is characterized with numerous blocky hummocks, ribbon-like pattern weaves and a networked cracks, and the rest half is more smooth. There is a good correlation between the scale of melt deposits (melt ponds and melt sheets) and their surface texture: smaller ones are more smoother.

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