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月面クレーターの中央丘上の衝突メルトの存在とその意義
Presence of impact melts on central peaks of lunar craters and its implications

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Introduction: Impact melts within complex impact craters are known to be flat and smooth deposits filling the floors or wall terraces [1]. Recent studies suggest that compositionally different layers with smooth surfaces are present on the central peaks in several lunar craters, implying impact melts [2, 3]. Impact melts on the central peaks could constrain the central peak formation timescale because impact melts will flow out if peaks are uplifted too quickly. However, little evidence and few examples of impact melts on the central peaks were reported. In this study, we investigate the central peaks of the all lunar complex craters listed by [4] to check for the presence of impact melts morphologically and compositionally.

Methods: Central peak morphologies and topographies are identified using SELENE data obtained by the Terrain Camera (TC, 7.4 m/pixel) and Multiband Imager (MI, visible: 20 m/pixel and near- infrared: 60 m/pixel); MI spectral data also provide compositions of geologic units. Impact melt textures are identified by characteristic features, such as cooling cracks and flowing features (lobes or levees), using data from the Narrow Angle Camera (NAC, 0.5-1.2 m/pixel) abroad the Lunar Reconnaissance Orbiter (LRO) in addition to SELENE data.

Results: At least 13 of the analyzed central peaks have distinctive impact melt morphologies on their slopes. Seventy craters (including the above mentioned 13 craters) have spectrally unique geologic units on their gentler slopes with smooth surfaces exhibiting low albedo and weak absorption depth similar to their floor melts. The 70 craters vary in setting, diameter, and formation age, while almost all the 13 distinctive melt morphologies are observed in the craters formed in Copernican period [4], which is the latest selenogical period.

Discussion and Conclusions: Our observation that impact melts are found on the central peaks of more than half of the Copernican period craters implies that many central peaks could have impact melts. My analysis suggests that the unique geological units on the 70 central peaks are possibly impact melt origin, and melt morphologies on the older central peaks are probably obscured by erosion, which implies it is common that impact melts did not flow out completely from the central peaks when the peaks were uplifted. This suggests that impact melts already had relatively high viscosity but were not completely solidified when central peaks were uplifted.

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