IMPACT MELT DISTRIBUTION IN COPERNICUS CRATER ON THE MOON Sharini K. S.[1,2] and G. R. Osinski[2], [1]College of Engineering, Guindy, Anna University, Chennai, India (shariniks@gmail.com), [2]Department of Earth Sciences, University of Western Ontario, London, ON, Canada (gosinski@uwo.ca).

Introduction: Impact melt deposits are found around fresh lunar craters and their distribution has been proposed to depend largely on the pre-impact topography and angle of impact [1,3]. Exterior melt deposits are found to occur in three modes: thin veneers, ponds, and flows [1]. Impact melt can flow for an extended period of time following the impact and tends to follow the topography and settle in areas of low elevation [2,3]. Many studies have discussed the distribution of impact melt in and around lunar fresh craters [1,3]. The distribution of impact melt provides insights into the impact cratering process.

In this study, we have mapped and analyzed the distribution of impact melt along and beyond the rim of the lunar complex crater, Copernicus (Fig. 1). Copernicus (9.64°N 20.08°W) is a well-preserved fresh 93 km diameter complex crater located in the eastern part of Oceanus Procellarum on the near side of the Moon. We used panchromatic imagery from Lunar reconnaissance orbiter's (LRO) Narrow Angle Camera (NAC), which has a spatial resolution of 0.5m/pixel [4] for creating a geomorphologic map of impact melt deposits in Copernicus crater. NAC has captured high resolution images of impact melt deposits within the interior and exterior of the crater. Along with the presence of veneers, ponds, and flows in Copernicus, we also discuss the occurrence of multiple impact melt channels in the terraces and near the rim of the crater that act as evidence for melt emplacement [5].

Impact Melt Features: The entire floor unit of Copernicus crater is hummocky and covered by impact melt that exhibits multiple fractures. On top of the crater's central peak, smooth melt units are also seen. Our geomorphologic map of Copernicus crater focuses on the impact melt units in the terraces and the surrounding continuous ejecta blanket, rather than the floor of the crater and the central peak. The melt deposits are represented and mapped as four different units: smooth melt ponds, melt channels, melt veneers and melt flows. All the mapped melt units are found to be located approximately within 39 km from the rim of the crater (Fig.1). Overall, more melt deposits are found in the northern portion of the exterior rim of the crater compared the southern part (Fig. 1).

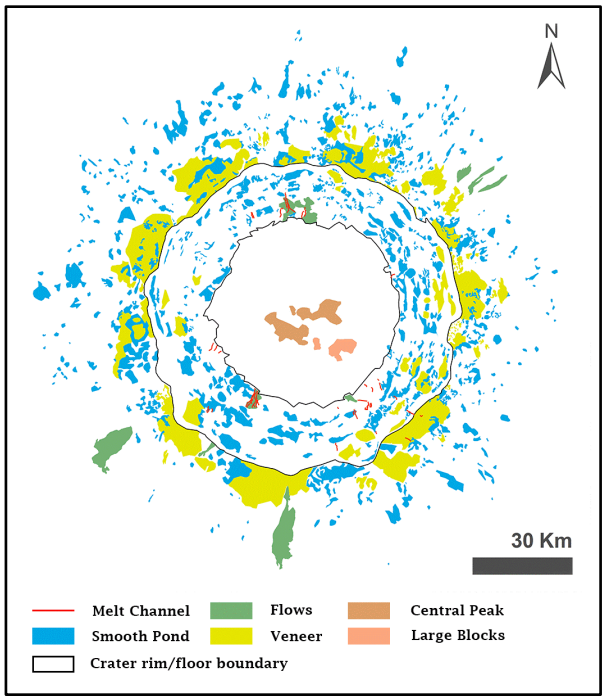

Figure 1: Geomorphologic map of impact melt deposits in the terrace and exterior rim region of Copernicus crater on the Moon.

Melt ponds: Our mapping shows that flat and smooth surfaced ponds of impact melt are very common at Copernicus (Fig. 1). Many such ponds have formed in topographic lows alongside the veneered melt surfaces (see below) outside the rim and in the terraces of the crater (Fig. 2a). They are identified due to their smooth surface, low albedo when compared to the surrounding regions and presence of cooling cracks (Fig. 2a). 716 ponds are mapped and they cover a total surface area of approximately 1,912 km^2.

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Melt flows: Impact melt flows occur preferentially in regions of steep slope where the melt follows the topography and flows towards the direction of low elevation (Fig. 2b). In addition to flow textures and patterns, cooling cracks are also seen in such flows. At Copernicus, flows are seen in the ejecta blanket where they flow outwards and in the innermost terraces of the crater where the flows merge with the melt deposits on the crater floor (Fig. 1) [6]. The flows seen in the ejecta blanket occupy a large surface area and the longest flow in the southern part of the ejecta stretches approximately 25 km in length (Figs. 1, 2b). We mapped 10 flows in the crater covering a combined area of ~ 262 km^2.

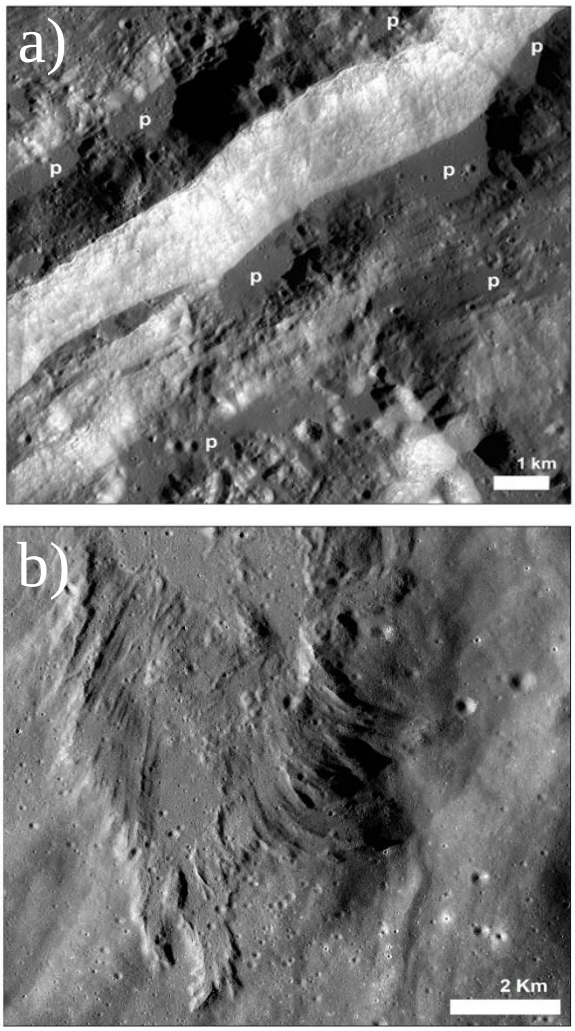

Figure 2: (a) NAC imagery (M1200262988R and M1200262988L) of melt ponds in the terrace and rim of Copernicus indicated by 'p' **(b)** NAC imagery (M1111947720L and M1111947720R) of large melt flow seen in the southern part of the ejecta.

Melt channels: Thin leveed channels which form a passage for melt to flow through are mostly seen in the terraces of Copernicus crater (Fig. 1, 3a). These drainage networks of melt are scarcely seen in the ejecta blanket. Many channels connect to form a single channel of melt and they are seen to mostly end and join the hummocky layer of melt in the crater's floor (Figs. 1). The total length of channels mapped is approximately 100 km.

Veneers: Veneers are sheets of melt that form a thin layer over the existing topography [2]. Such thin layers of melt are mostly seen near the rim of the crater and few are seen in the terraces too. While they do not vary much when compared to the albedo of the surrounding terrain, their occurrence is noted due to the presence of cooling cracks (Fig. 3b). They occupy a surface area of approximately 1,655 km^2 and so they are the largest melt feature observed in Copernicus crater.

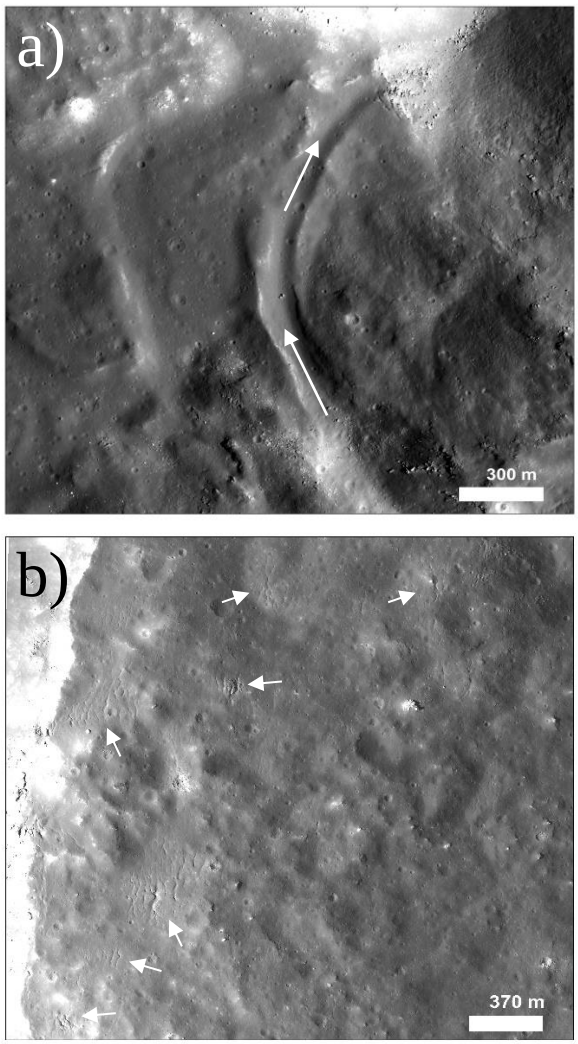

Figure 3: (a) NAC imagery (M1151994158L) of impact melt channel and direction is shown using arrows. **(b)** NAC imagery (M1144921399R) of thin sheets of veneers shown using arrows.

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