A TALE OF TWO CRATERS: IMPACT MELT AT TWO VERY SMALL CRATERS ON THE MOON. B. R. Hawke[1], T. A. Giguere[1,2], S. Lawrence[3], V. Bray[5], B. W. Denevi[4], B. Garry[6], L. Gaddis[7], L. Kestay[7], M. Robinson[3], and the LROC Science Team, [1]Hawaii Institute of Geophysics and Planetology, University of Hawaii, Honolulu, HI 96822 (hawke@higp.hawaii.edu), [2]Intergraph Corporation, Box 75330, Kapolei, HI 96707, [3]School of Earth and Space Exploration, Arizona State University, Tempe, AZ 85281, [4]Applied Physics Laboratory, The Johns Hopkins University, Laurel, MD 20723, [5]University of Arizona, Sonett Space Science, Tucson, AZ 85721, [6]CEPS, National Air and Space Museum, Washington, D.C. 20560, [7]U.S. Geological Survey, Astrogeology Science Center, Flagstaff, AZ 86001.

Introduction: Young lunar craters and some older large craters have deposits of lava-like material in and around the crater. Initially thought to be volcanic because of their flow-like morphology, these deposits are now known to have originated by high shock pressures and related melting of materials at the impact site [e.g., 1,2]. Lunar impact melts are observed as thin, hard-rock veneers, flows, and ponds [3,4]. In the immediate post-Apollo era, impact melts were not identified in or around craters less than 4 km in diameter [3,4]. Lunar Reconnaissance Orbiter Camera (LROC) images have allowed the identification of several very small (<4 km) impact craters that exhibit abundant interior and exterior melt deposits. The purpose of this report is to present the results of an investigation of the distribution and modes of occurrence of the interior and exterior melt deposits associated with two very small and extremely young impact craters.

Data: High resolution LROC [5-8] Narrow Angle Camera (NAC) image pairs (M141932532, M112902715) of each study area were mosaicked. Solar incidence angles averaged 51 degrees, and resolution ranged from 0.48 to 0.57 meters/pixel. The topography around the craters was examined in the 500 meters/pixel resolution WAC DEM [9].

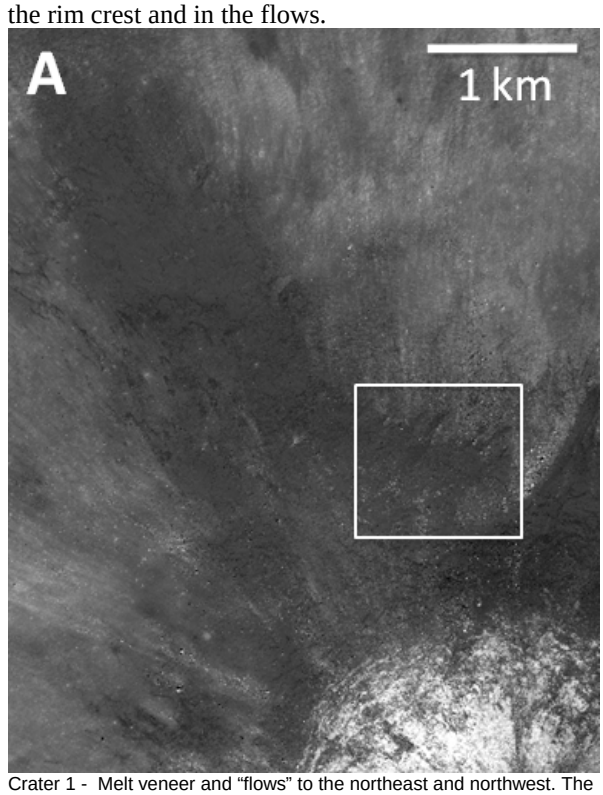
Results and Discussion: Crater 1 is an unnamed small, very fresh, 2.9 km diameter crater east of Atlas crater (Lat: 46.7 N, Lon: 49.8 E), that exhibits an unusually large amount of exterior melt for its size.

Interior Melt Deposits – Crater 1.

A melt pond resides on the northeast corner of the floor (*Figure A)*. The 0.1 km^2 pond appears to exhibit a longitudinal flow feature from the northwest to the southeast. The remainder of the 0.6 km^2 floor exhibits five or six melt patches amoungst the small hummocks and rubble. A minor amount of melt veneer is found on the southeast wall along with extensive dark loose debris.

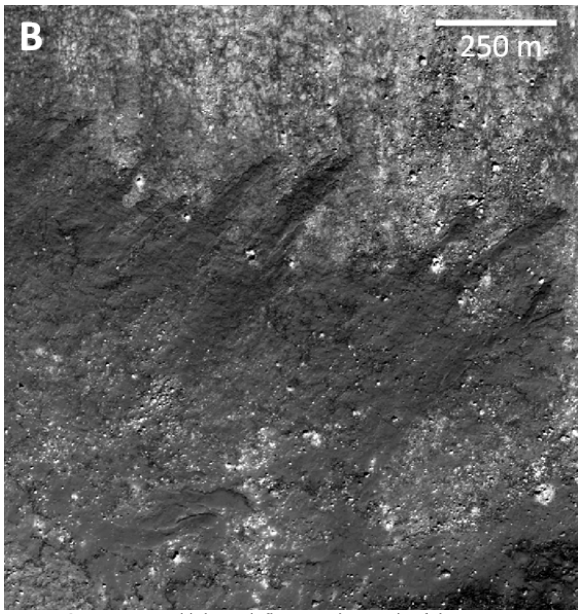
Exterior Melt Deposits – Crater 1.

Veneer and Melt Ponds. Melt veneer was identified primarily on the northwest and northeast rim crest *(Figure A)*. No appreciable veneer was observed on the southern rim. No rim coverage was available to the east. Melt veneer is most abundant on the northeast crater rim and thins towards the northwest. Cracks in the veneer concentric to the crater rim are observed; these may be created by downslope tension after emplacement. Mass wasting of fragmented rim veneer is observed at some locations occurring sometimes as individual blocks and other times as clusters of blocks. Some small shallow melt ponds were observed near the rim crest and in the flows.



Crater 1 - Melt veneer and "flows" to the northeast and northwest. The white box shows the location of Figure B. Crater rim crest at lower right.

Flows. Two large "flows" are prominently visible projecting to the northeast and northwest. The northwest continuous melt ejecta is over 1 km wide and travels to distance of 4.5 km, which is more than a crater diameter. Discontinuous material can be found up to 5.4 km from the crater rim crest. There is enough melt material 2.5 km from the rim crest to form small flows, and further out the melt volume decreases and thins to a veneer. On the east side of the main flow, less than a km from the rim crest, we see a series of finger-like melt flows *(Figure B)*.

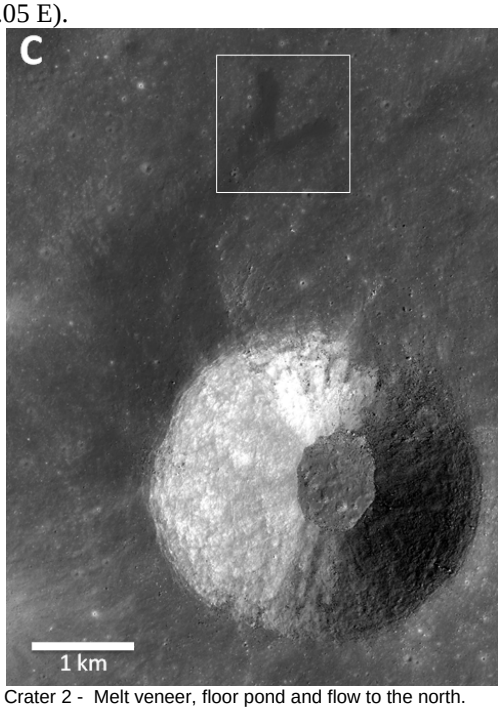


Crater 1 - Multiple melt flows to the north of the crater.

The longer flows range between 200 and 300 meters in length and are 30 to 40 meters in width. A large amount of melt may have landed just beyond the rim-crest and flowed downslope. The northeast melt flow starts near the rim crest and flows to a distance of 1.7 km. Small digitate lobes are seen along the margin and at the terminus of the main flow.

Melt Deposits – Crater 2.

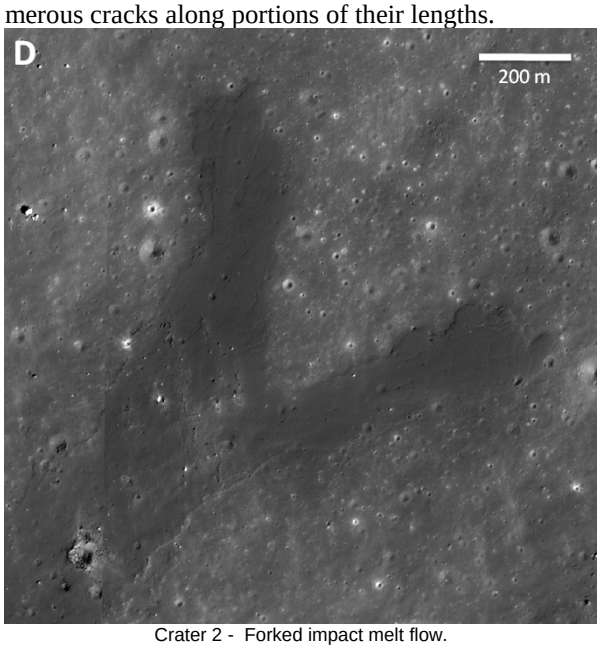
Crater 2 is a relatively young, unnamed 3.1 km crater located southwest of Steno N, ENE of Mare Moscoviense in the farside highlands. (Lat: 30.02 N, Lon: 161.05 E).



Crater 2 - Melt veneer, floor pond and flow to the north. The white box shows the location of Figure D.

Hard-rock veneer was identified on many portions of the crater rim. Impact melt deposits (0.6 km^2) can be seen on the crater floor which has a calculated total volume of 0.008 km^3 [10] *(Figure C).*

The curved impact melt flow extends NNW from the rim of Crater 2. The furthest extent of the flow reaches 2.5 km from the rim crest, which is nearly a crater diameter away. The melt flow splits into two separate flows due to the influence of local topography *(Figure D).* At the point that the two flows diverge, the main flow is 324 m wide. The northern flow segment extends 675 m begond the point of divergence and is 195 m wide near its end. The northeastern segment extends for 550 m from the main flow and is 206 m wide near its end. Both flow segments exhibit numerous cracks along portions of their lengths.



Crater 2 - Forked impact melt flow.

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