

IMPACT MELT COVER ON CENTRAL PEAKS OF COMPLEX CRATERS: IMPLICATIONS FOR DERIVING CRUSTAL COMPOSITION. Deepak Dhingra¹ and Carle M. Pieters², ¹Dept. of Physics, University of Idaho, Moscow, ID, USA (Email: deepdpes@gmail.com), ²DEEPS, Brown University, Providence, RI, USA

Introduction: Central peaks of complex craters are believed to be the deepest crustal exposures (in some cases, possibly mantle) within a crater [e.g. 1]. This key attribute, along with their generally steep slopes (offering fresh surfaces) and prevalent occurrence of the complex craters, has enabled the extensive use of central peaks for determining crustal compositional trends [e.g. 2,3,4,5]. However, the occurrence of impact melt deposits on the peaks of several impact craters [e.g. 6,7,8,9] raises an important question: *whether the central-peak-derived mineralogy is representative of the crustal composition at depth?* To address this question, we have carried out coordinated ‘geological mapping’ & ‘mineralogical assessment’ at impact craters [10, 11] to enable mineralogical comparison of *impact melt-covered* vs *melt-free* regions on the peaks.

The Non-Unique Nature of Impact Melt: Impact melt deposits lack a unique mineralogical signature, meriting detailed evaluation to understand their influence on the central peak mineralogy. Impact melt can exhibit glassy to a completely crystalline texture [12] which directly affects the spectral properties. Further, we have documented examples of heterogeneous impact melt mineralogy within an impact crater [13, 14] as well as examples of homogeneous impact melt [11].

Impact Melt Studies at Crater Jackson: The central peaks of Jackson (Dia. 71 km) provide an excellent example to illustrate the potential influence of impact melt cover on the central peak mineralogy (Figure 1). The peaks are well-known for their exposures of crystalline plagioclase as well as a mafic unit which was suggested to be of potentially impact melt origin [6]. Our mapping of several additional impact melt exposures on the peak [10] and coordinated mineralogical assessment highlights some important aspects:

a) *Melt-covered peak regions exhibit heterogeneous mineralogy:* Impact melt on the peak exhibits contrasting composition with majority of the mapped melt having mafic mineralogy (Fig. 1b; green & red units) while some indicating a feldspathic affiliation (yellow unit). This compositional diversity *within* impact melt illustrates the strong influence of melt mineralogy on the central peaks and the need for such regions to be excluded before deriving any compositional estimates.

b) *Melt-free peak exposures could still be melt coated:* Although large sections of the peak lack any morphological evidence of impact melt, the rather seamless mineralogical continuity across some of these units and the nearby impact melt (regions marked with arrows in Fig. 1c) potentially indicates a thin veneer that cannot be directly detected but can possibly be inferred. Since remotely-derived mineralogy relies on the scattered light from the top few microns, such a coating might further limit the availability of pristine peak regions for deriving crustal composition at depth.

Summary: Central peak impact melt exposures may potentially influence peak mineralogical estimates and the inferred compositional trends of the lunar crust.

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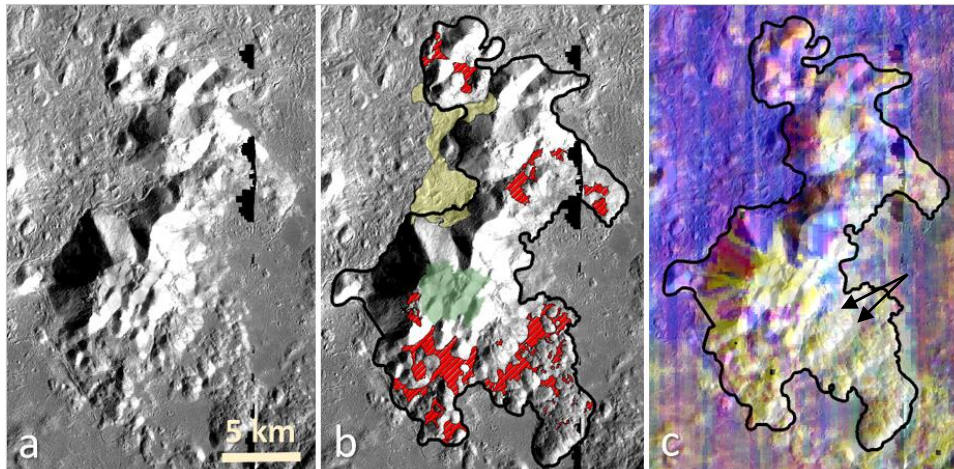


Figure 1 Assessment of impact melt cover on the central peaks of Jackson crater. (a) Kaguya TC context image of the central peaks. (b) Mapped impact melt units on the peak (modified from [10]). (c) Mineralogical color composite of the peaks and surroundings based on Moon Mineralogy Mapper (M³) data. Red = 1 μ m absorption band strength, Green = 2 μ m absorption band strength, Blue = Albedo at 1489 nm.