GEOLOGIC MAPPING, MORPHOLOGY, AND DATING OF THE KING CRATER REGION – LUNAR FARSIDE

J. W. Ashley,[1] B. R. Hawke[2], N. DiCarlo[1], A. C. Enns[1], H. Hiesinger[3], M. S. Robinson[1], H. Sato[1], E. J. Speyerer[1], C. H. van der Bogert[3], R. V. Wagner[1], K. E. Young[1], and the LROC Science Team. [1]Lunar Reconnaissance Orbiter Camera, School of Earth and Space Exploration, Arizona State University, Tempe, AZ 85287-3603; [2]Hawaii Institute of Geophysics and Planetology, University of Hawaii, Honolulu, HI; [3]Institut für Planetologie, Westfälische Wilhelms-Universität, Münster, Germany.
E-mail: james.ashley@asu.edu.

Introduction: Since its discovery on the lunar farside, King crater (5.0°N and 120.5°E) has been a site of fascination to the lunar science community; and recently, as a Constellation site of interest, become appealing to the goals of human space exploration. The crater-forming impact interacted in a complex way with pre-existing topography, and a variety of impact processes can be explored in the morphology of the resulting features. In particular, the King crater impact melt pond (~17 km diameter; located in nearby Al-Tusi crater) provides opportunities to study large volumes of once-molten material of dominantly anorthositic composition. The Lunar Reconnaissance Orbiter Camera (LROC) Wide Angle Camera (WAC) and Narrow Angle Camera (NAC) [1] imaged King crater from a nominal 50 km altitude at pixel scales of 100 meters and 0.5 meter, respectively. Images were used to create detailed geologic maps for the region at both scales, with the NAC emphasis on the melt pond. Digital elevation models (DEMs) were also derived from both WAC [2] and NAC [3] images for the area.

Discussion: The high-resolution NAC images are particularly useful for augmenting previous mapping efforts [e.g. 4], showing fine details within the main melt pond that raise questions on melt pond dynamics and evolution. These include both positive and negative relief features, craters with anomalous morphologies (involving hummocky floors, irregular outlines, and boulder associations), and complex flow morphologies. NAC images also show 1) interactions of melt with slump blocks in the crater wall terraces, 2) anomalous mounds and other morphologic complexities in the crater floor melt deposits, and 3) details of deceleration lobes in the distal ejecta blanket. Crater counts on the extended ejecta blanket [e.g., 5] show that King crater is likely to be ~ 1 Ga in age.

Based on pre-existing topography assumptions, an 175 m depth was estimated for the main melt pond using the NAC DEM, which also reveals kilometer-scale topographic depressions, particularly across the central and eastern portions of the pond. Vertical displacements within these depressions from their inferred original equipotential surfaces range from 15 to 20 meters. The perimeters of these downwarped zones correlate with the occurrence of negative relief features (~10 to 100 m in length). The sagging may have occurred as the result of contraction and/or compaction within the melt both during and following cooling. Some negative relief features in the melt pond appear to show evidence of collapse into subsurface voids, and are likely the result of melt withdrawal, indicating some mechanism for local drainage while significant volumes of melt remained mobile.

References: [1] Robinson M. S. et al., 2010. *Space Sci. Rev.* 150, 81-124. [2] Scholten et al., 2011. LPSC XLII, abs. #2046. [3] Tran T. et al., 2010. ASPRS CaGIS *Specialty Conf.* [4] Wilhelms D. E. and El-baz F. 1977. *USGS*, Map I-948. [5] Ashley et al., 2011. LPSC XLII, abs. #2437.