

## **Lowell crater: A region of prime geological importance on the Moon**

Neeraj Srivastava

PLANEX, Physical Research Laboratory, Ahmedabad, India (sneeraj@prl.res.in)

Detailed surface topography, morphology, morphometry, spectral reflectance studies, and crater chronology of the Lowell crater region have been carried out using data from Kaguya (JAXA), LRO (NASA) and Chandrayaan-1 (ISRO) missions. The study has revealed that the Lowell crater is characterized with several peculiarities. Some of these include: a) conspicuous W-E asymmetries in the morphological make-up of the central peak, crater wall and floor constituents; b) low albedo proximal ejecta blanket mainly confined to the northern areas; c) distribution of exterior melt pools only on the northeastern side; d) possible exposures of olivine bearing undifferentiated mantle rocks; e) a Copernican age of formation, even though characteristic rays are absent; and, f) possibility of recent volcanism inside it. Most of these observed specialties in the case of the Lowell crater are related to variations in the pre-existing topography and target material properties, which are related to its broad geological context i.e. its location inside the Orientale basin and the nature of the Lowell forming impact event. It has been deciphered that the Lowell crater formed in the Montes Rook region of the Orientale basin during Younger Copernican period ( $374 \pm 28$  Ma old) due to an oblique impact of a  $\sim 5.7$  km diameter projectile from the S-SW direction, at an angle of  $\sim 30$ -45 degrees. Thus, the Moon was hit by at least four projectiles of  $\sim 6$  km diameter during the Younger Copernican period, the others three being those responsible for the formation of craters Jackson, Ohm and Tycho. In addition to these, the morphology of the Lowell crater favors much debated extent of the Orientale transient cavity to lie between the ORR & the IRR. Thus, the study establishes the Lowell crater as a site of prime geological importance on the Moon that has the potential to address several important issues related to lunar geology such as basin and crater forming process, nature of the mantle, and relationship between impact cratering and volcanism.