

# Illumination conditions near the lunar north pole and three potential landing sites

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**Abstract** We produced a 400 x 400 km Digital Terrain Model (DTM) surrounding the lunar north pole from Lunar Orbiter Laser Altimeter (LOLA) ranging measurements. To achieve a consistent, high-resolution DTM of 20 m/pixel the individual ranging profiles were adjusted to remove small offsets.

We used this LOLA DTM to simulate illumination conditions at surface level (height above ground  $h=0\text{m}$ ) for a 50 x 50 km region centered on the north pole. Illumination was derived in 1 hour increments from 01 January, 2016 to 01 January, 2017 to simulate typical long-term conditions during a future landing mission.

Near the north pole we identified three clusters of spots receiving high levels of illumination, namely the pole-facing crater rims of Hinshelwood, Peary and Whipple. Their accumulated illumination levels range from 62.73% to 79.93%, where on the rim of Whipple crater the locations with highest illumination levels can be found (Fig 1). A more detailed study was carried out for these sites as targets for a lander or rover equipped with solar arrays.

For this purpose we assumed a lander with a structural height above the ground of 2 m (height of the solar panels) and simulated the illumination conditions over a period of 20 years. The chosen period is longer than the lunar precessional cycle of 18.6 years allowing us to determine the suitability of these sites with respect to direct solar illumination.

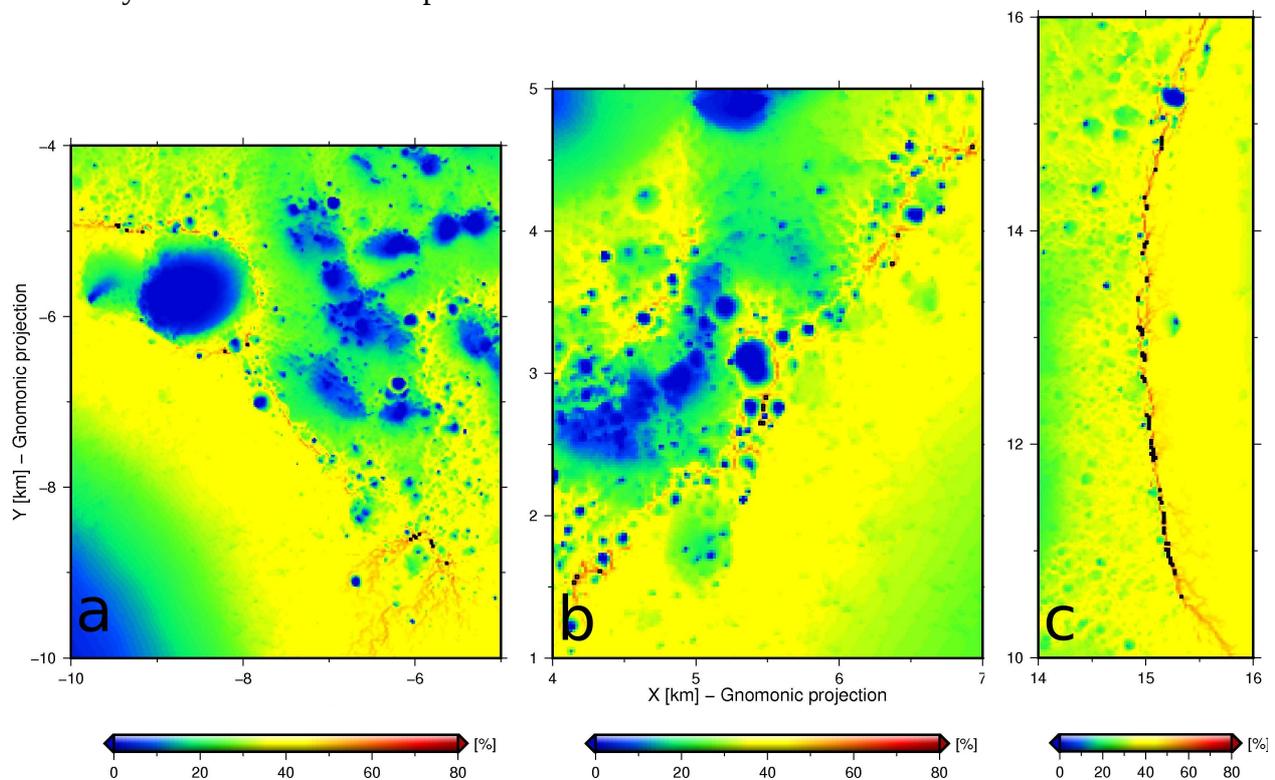


Figure 1: Accumulated illumination maps at surface level over a one-year period from January, 01 2016 to January, 01 2017 for (a) Hinshelwood Crater, (b) Peary Crater and (c) Whipple Crater. Pixel shown in black indicate locations receiving more than 62% of illumination.