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POTENTIAL LANDING SITES FOR THE CHANG'E-4 EXPLORATION MISSION TO THE APOLLO BASIN, MOON.

Abstract

As the oldest and deepest impact structure on the Moon, the South Pole-Aitken Basin (SPA) on the lunar farside is a scientifically high priority site for human and robotic exploration. The lunar farside has not been visited by any exploration missions so far, but it is the focus for Chang'e-4 robotic missions planned for the end of 2018. The Chang'e-4 mission aims to deploy a relay satellite into Halo-orbit around EM-L2 and land with a Yutu heritage rover on the lunar surface. The provisional scientific objectives of Chang'e-4 are to study: (1) the interaction between the solar wind and lunar surface, (2) the formation mechanism of lunar regolith and dust, (3) the lunar-based VLF astronomical potential, (4) the regional geochemistry and subsurface, and (5) the recent impact flux of the Moon. One of the landing site candidate for the Chang'e-4 robotic mission is the 538 km-diameter Apollo basin in the NE quadrant of the SPA basin. Here, we provide a detailed analysis of three high-priority regions of interest (ROIs) with example rover traverses of 2.5 km, 5 km and 10 km radius from the center of ROIs in the central and southern mare deposits of the Apollo basin. The proposed high-priority ROIs have high scientific interest based on prioritized science concepts defined in the 2007 National Research Council (NRC) report and the scientific objectives of the mission. To evaluate the potential science return of each proposed ROI, we use all available datasets from previous lunar missions and studies. The terrain trafficability is determined via slope maps, and digital elevation models derived from the LOLA instrument, at resolutions of 60 m/pix. The terrains that compose the Apollo basin are visualized using LRO WAC mosaics of 100 m/pix, and individual NAC images of 1 m/pix, and Kaguya Terrain Camera images of 7 m/pix. We use the Kaguya images as the photobase for geologic mapping and counting craters ¿50m for crater size-frequency distribution analyses. Geologic maps at 1:50,000 scale are being compiled for the central and southern portions of the Apollo basin, as well as a detailed regional geologic map of the northern portion of SPA. FeO and TiO2 contents are determined using Clementine 100 m/pix global maps, as well as Kaguya LISM 80/pix data.