

GEOLOGIC MAPPING OF THE APOLLO LUNAR QUADRANGLE (LQ-24), EASTERN SOUTH POLE-AITKEN BASIN. S. C. Mest¹, N. E. Petro², L. R. Ostrach³, B. L. Jolliff⁴, and R. A. Yingst¹, ¹Planetary Science Institute, 1700 E. Ft. Lowell Rd., Suite 106, Tucson, AZ 85719 (mest@psi.edu). ²Planetary Geodynamics Laboratory, NASA GSFC, Greenbelt, MD 20771, ³Astrogeology Science Center, USGS, Flagstaff, AZ 86001, ⁴Dept. of Earth and Planetary Sciences, Washington University, St. Louis, MO 63130.

Introduction: We are creating a geologic map of the Apollo Lunar Quadrangle 24 (LQ-24) that covers the eastern portion of the South Pole-Aitken (SPA) basin on the Moon. At ~2,500 km across, SPA is the largest and oldest confirmed lunar basin and key questions remain regarding the age of the basin, its resurfacing history, and the origin of surfaces and various terrains within the basin. High-resolution image, spectroscopic, and other remote sensing data from recent lunar missions have significantly improved the ability to interpret the composition and origin of geologic units. These data allow scientific investigations to address important questions about the formation and evolution of SPA. Our mapping effort is integrating these datasets to construct the first geologic map of eastern SPA since the 1970s, which were constructed from relatively low-resolution Lunar Orbiter images.

This mapping effort follows the mapping standards set by the United States Geological Survey (USGS) and will produce a Scientific Investigations Map (SIM) that will be published through the USGS, enabling dissemination throughout the scientific community and use in future scientific analysis. This map will complement geologic maps of neighboring quads (to the west and south) that are currently in development [1,2].

Background: The geologic map of LQ-24 covers the eastern half of SPA within the boundary of 30° to 60° S latitude and 180° to 240° E longitude, and is being prepared in Lambert Conformal Conic projection. We are using ArcGIS (v. 10.8) to map LQ-24 at a scale of 1:250,000, which will yield a printed map at 1:2,500,000 scale.

We are using the LROC WAC mosaic (100 m/pixel) as our primary basemap (Figure 1). We are supplementing the WAC basemap with derived LOLA products (DEM (Figure 1), hillshade), and Kaguya morning and evening Terrain Camera mosaics to assist in our mapping effort. Additional high-resolution data acquired from recent lunar missions have completely changed not only what we see on the surface of the Moon, but also how we can look at the Moon. Lunar Reconnaissance Orbiter (LRO) images and mosaics cover LQ-24 over a range of illumination angles, enabling detailed morphologic mapping. Derived (or derivable) products from several instruments (e.g., Diviner, LOLA, LROC, M3, LP-GRS) provide additional morphologic and compositional information

that are being used to characterize the geologic diversity of Eastern SPA. Once geologic units are mapped, their relative ages will be determined from measured crater densities and observed stratigraphic relationships.

Physiography of LQ-24: The LQ-24 quadrangle consists of highland terrains that cover approximately the northeastern corner of the map area. The remainder of the map area is covered by the floor of the South Pole-Aitken (SPA) basin. The highland terrains are heavily cratered relative to the floor of SPA. The map area exhibits approximately 15 km of relief between the highlands in the northeast (max relief ~6,730 m) and the floor of SPA (~-8,700 m).

The floor of SPA, and the floors of many of the craters that impacted the floor of SPA (e.g., Apollo, Leibnitz, Oppenheimer), display surfaces that range in albedo from dark to bright, and texture from smooth to rugged. The surface displays predominantly low albedo, or dark) and moderate albedo materials. Dark materials are found mostly on the floor of Apollo and in a few small areas on the floor of SPA, whereas moderate albedo materials are more abundant throughout SPA. At LROC WAC scales, the dark material and portions of the moderate albedo material appear relatively smooth; however, some areas of the moderate albedo material appears rugged. These materials, as well as the other surface units in the map area, are being mapped and described in detail as the project progresses.

Geologic Mapping Progress: Currently, we have mapped structures down to 10 km. These include impact basins and craters 10 km in diameter, and linear features, such as scarp crests, fractures, volcanic channels, and miscellaneous lineations down to 10 km in length. Fresh-appearing impact structures are mapped using the basin (e.g., Apollo basin rim) or crater rim line symbols, whereas more degraded rim structures are mapped with the buried rim line symbol.

References: [1] Yingst, R. A. et al. (2016) *Annual Planetary Geologic Mappers Meeting*, Abstract #7008. [2] Mest S. C. et al. (2016) *Annual Planetary Geologic Mappers Meeting*, Abstract #7045.

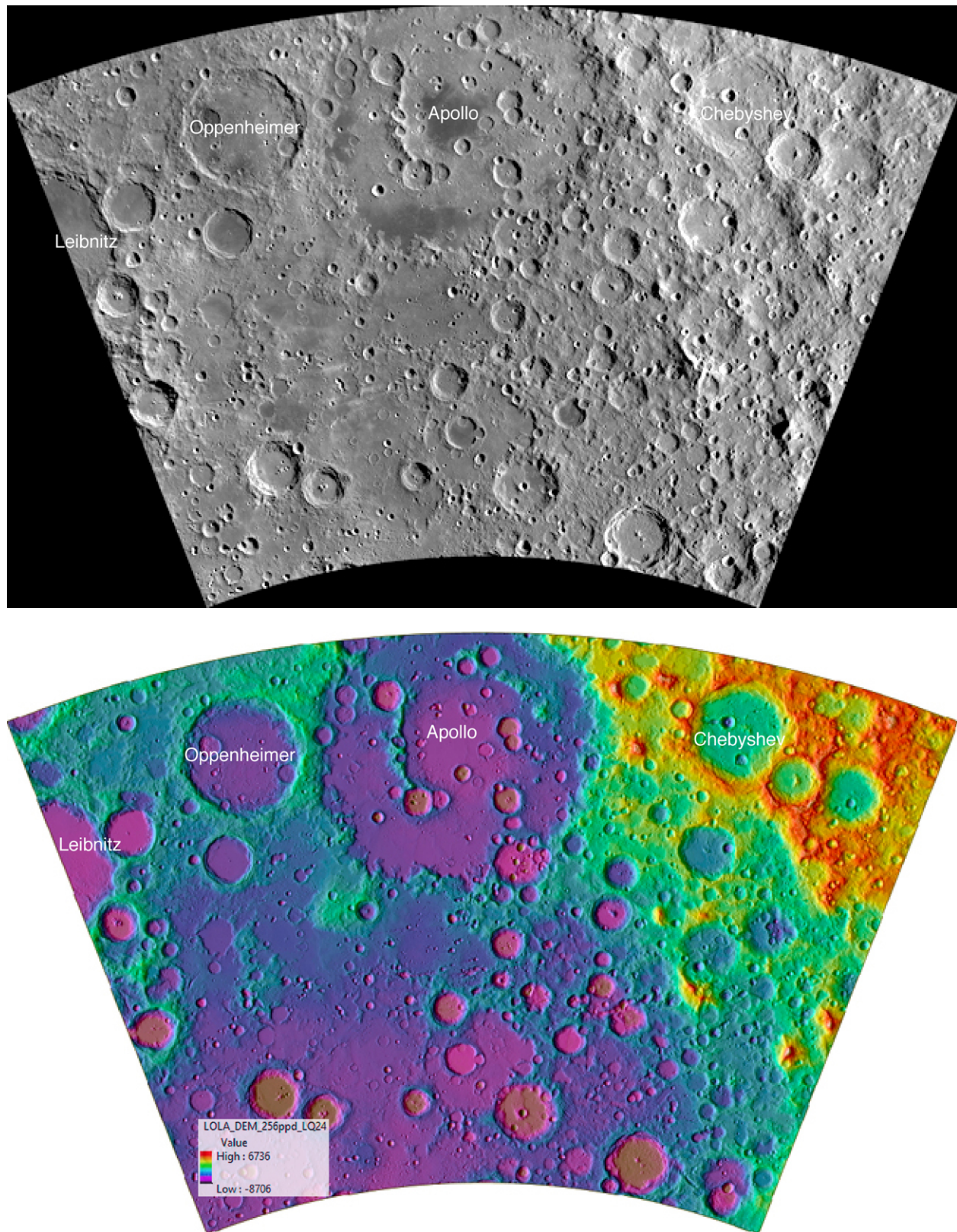


Figure 1. (top) LROC WAC mosaic (100 m/pixel) and (bottom) LRO LOLA DEM (303 pixels/degree) of LQ-24, the Eastern South Pole-Aitken Basin (or Apollo) Quadrangle of the Moon. Major impact craters are noted; Apollo crater is 537 km in diameter. Projection is Lambert Conformal Conic; quadrangle is centered at 45°S, 210°W.