

HIGH RESOLUTION MOSAIC AND DIGITAL TERRAIN MODEL IN THE LUNAR SOUTH POLE REGION DERIVED FROM CLEMENTINE DATA.

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The lunar south pole is one of the most interesting areas for lunar exploration especially after the possibly finding of water in this area by Clementine and its likely confirmation by Lunar Prospector. It has areas permanent in shadow and areas that are nearly permanent in sunlight.

For topographic studies we identified 4,000 filter B images taken by the Clementine UVVIS camera with their image footprints within latitudes of -75deg to -90deg. We found 14 nadir pointed frames covering the area between 100deg-240deg W/ 88deg-89.7deg S suitable for stereo data processing that show the investigated area under different viewing angles. The stereo angles between image pairs are between 3.6deg and 12.3deg. As a consequence of these stereo angles and the accuracy of the navigation data the absolute height accuracy is approximately 1 km and the relative height accuracy is 200 m - 300 m. Conjugate points and their respective coordinates have been identified, and absolute elevations have been determined by bundle block adjustment techniques. We derived a small digital terrain model (DTM) of about 66 km by 22 km with a grid spacing of 200 m, covering parts of the so-called "Peak of Eternal Light" and the rim of crater Shackleton (Fig. 1).

The results indicate that the highest elevations near the south pole at 180deg W/-89.76deg are 3 km above the mean lunar radius. This number is well above the data of current models. As a consequence the overall area in shadow could be smaller than previously calculated. Yet the results do not rule out permanently shadowed areas within deep craters in the vicinity of the south pole. [1]

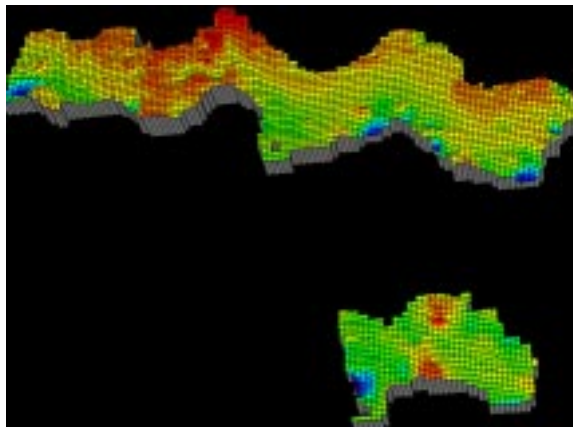


Fig. 1 Oblique view of the terrain model /South pole

In order to study this region, we derived a high resolution mosaic with a digital map scale of 20 m/pixel. We identified 10,000 images of filter D (750 nm, effective band width 50 nm) obtained by the Clementine HIRES camera within latitudes of -86deg to -90deg. We use approximately 3000 images which exhibit a gray-level with an average DN value > 8 DN. After projecting all images into a polar stereographic projection we combined the single images to a mosaic (Fig. 2). The mosaic boundary is characterized by large craters such as Cabeus, Malapert and Amundsen.

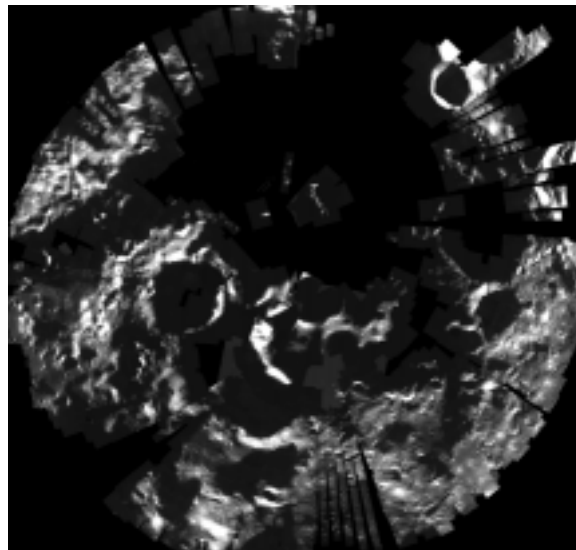


Fig. 2 Mosaic of 3000 Clementine HIRES images of the South pole covering the region -86deg to -90deg

Unfortunately, the region extending from 0deg +/- 20deg longitude does not contain any information due to the lack of coverage. The mosaic shows a heavily cratered surface. The sizes of craters vary from 100 m to 40 km in diameter. These high resolution image data are the basis for analysis of the local geologic history. These results will be demonstrated at the conference.

References:

- [1] Wählisch M. et al. (1998) EGS XXIII, C 1032