lie fresh deposits from Lichtenberg crater. Age relations between basalt units and the crater Lichtenberg merit detailed assessment.

An overview of the Lichtenberg region using a Clementine 750 nm albedo mosaic is shown in Fig. 4. Lichtenberg crater is ~20 km in diameter. A SMART-1 image of the crater taken at a lower Sun angle is shown in Fig. 5. In the region surrounding Lichtenberg crater, basalt deposits appear to be superposed on the eastern ejecta deposit of this relatively young crater (Schultz, 1976; Hawke et al., 2000). Embayment relations between the young basalt and the crater ejecta are best seen in very low Sun-angle images (such as a few obtained from orbit during Apollo 15). Clementine color composite data and Lunar Prospector data both indicate that the young basalt to the east is Ti-rich and compositionally different from the older basalts to the north and west.

The characteristics and evolution of mare basalts record the nature of the lunar mantle and its melting as a function of time, and this provides essential constraints about the geological and thermal evolution of the Moon (e.g., Hiesinger and Head, 2006; Shearer et al., 2006). Analysis of the properties of surface units from remote sensing and returned samples provides abundant evidence for a wide range of basalt types and for changes in both the total flux of basaltic material produced and the composition of basaltic volcanism as a function of time (e.g., Hiesinger et al., 2000). Remote sensing data also identifies relatively young high-titanium basalts in the northwestern part of the nearside, an area not sampled by Apollo or Luna (e.g., Pieters, 1978; Hiesinger et al., 2003). Crater size-frequency distribution data have been interpreted to indicate that the basalts embaying Lichtenberg are actually among the youngest on the Moon, perhaps dating to the last billion years (e.g., Schultz and Spudis, 1983; Hiesinger et al., 2000, 2003).

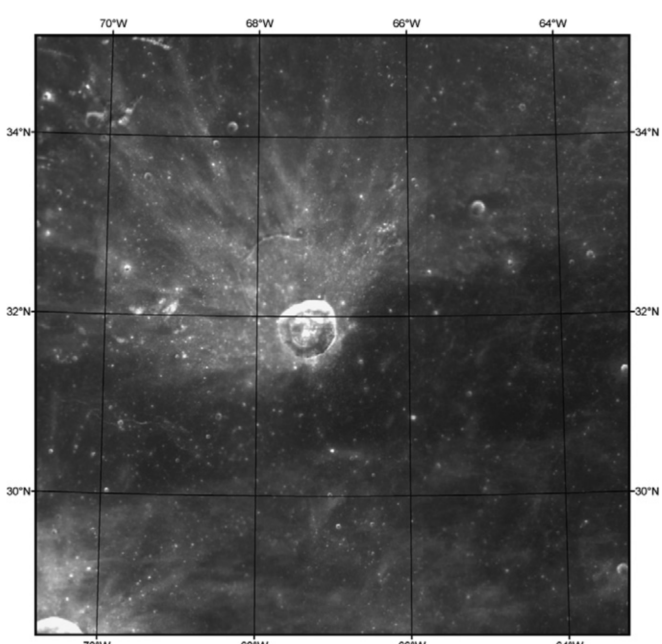

Fig. 4. Clementine 750 nm albedo image for the Lichtenberg region. Lichtenberg is ~20 km in diameter.

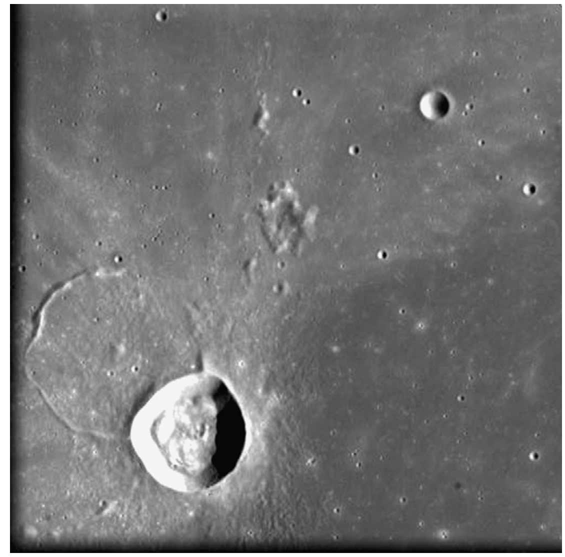
Fig. 5. SMART-1 image that includes the crater Lichtenberg under a different illumination. The AMIE camera obtained the images with a ground resolution of between approximately 186 and 195 m/pixel.

Important science goals for this region include the documentation of the geological relations between the young mare deposit and Lichtenberg crater ejecta, and a detailed comparison between the composition of these young high-titanium basalt and the much older high-titanium basalts found on the eastern part of the nearside (e.g., Mare Tranquillitatis). Do these young basalts represent a return to melting of a source region similar to that which formed the earlier deposits, or is there evidence for an entirely different petrogenetic process?

3.3. L-ISCT #3 Apollo 15 Hadley Rille

Target center: 26.1°N; 3.7°E

Principal rationale: The evolution of this site on a ring of Imbrium Basin records a diversity of fundamental geologic processes that are best addressed with diverse and integrated data. The wide range in scale, morphology, and composition of features at Hadley Rille make this target particularly challenging and interesting.

A Clementine high Sun albedo mosaic of the Apollo 15 region is shown in Fig. 6. A SMART-1 image of the area taken when the Sun is lower to the west is shown in Fig. 7. The rille can be seen crossing through the mare basalt in the center of the image. The Apennine Mountains form the eastern boundary and cross the image from upper right to lower left.

Hadley Rille, a sinuous depression over 130 km long, and the Apennine Mountains, the arcuate range of massifs forming part of the Imbrium Basin rim, have captured the interest of lunar scientists for decades. The Apollo 15