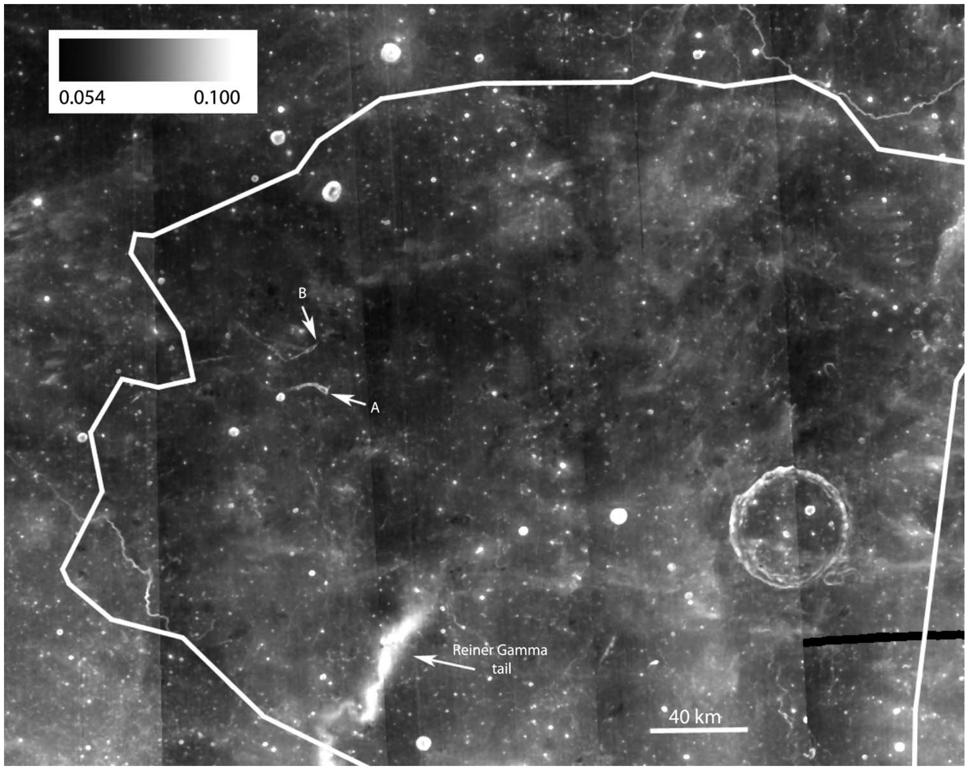

Figure 1. Mosaic of the Marius Hills volcanic complex at 750 nm from the Moon Mineralogy Mapper M^3. The mosaic is made of six individual strips at a resolution of 280 m/pix. The 41 km Marius crater is located in the lower right, and the bright feature at the center bottom is the tail of the swirl Reiner Gamma. The area includes most of the domes; the white line is the approximate plateau boundary identified by *Whitford-Stark and Head* [1977]. The gray level is in apparent reflectance. A 3 × 3 median filter was applied to reduce vertical striping. Arrows point to the largest rilles of the MHC discussed in the text.

2–15 km, an elevation of 200–500 m and many are located on the top of low domes.

[4] The MHC also contains 59 cones with a maximum diameter of 3 km and an elevation up to 300 m above the plateau surface [*Whitford-Stark and Head*, 1977]. The cones of the MHC commonly display a horseshoe appearance resulting from the breaching of one side of the cone by lava flows. The cones are not only located on top of the domes, but can also be found on ridges and plains materials, most commonly between other edifices. Many of these isolated cones are not breached. *Whitford-Stark and Head* [1977] interpreted the cones to be composed of pyroclastic materials. The cones formed on the Moon are broader and lower than those formed on Earth because of the low gravity and lack of atmosphere [*Wilson and Head*, 1981]. Finally, at least one cone has been identified as the source of one of the Marius Hills rilles [*Greeley*, 1971].

[5] There are 20 sinuous rilles located predominantly in the western region of the MHC [*Whitford-Stark and Head*, 1977]. Recent observations by the Lunar Reconnaissance Orbiter (LRO) spacecraft allow the production of a local Digital Terrain Model (DTM) for at least one of them [*Lawrence et al.*, 2010]. The average relative depth along sinuous rille A [after *Greeley*, 1971] is 250 m, with layers formed by lava flows and large boulders exposed in the walls [*Lawrence et al.*, 2010]. This rille is indicated by the A in Figure 1.

[6] Although the MHC was determined to be composed of different volcanic edifices and lava flows on the basis of photogeologic analyses, the first identification of different compositional units was made by *Sunshine et al.* [1994] using the Galileo multispectral images at a scale >1 km. Two units were identified based on the brightness differences and ratios in the visible and near infrared (0.76/0.99 μm, a simplified 1 μm band strength). Later observations of the MHC with Clementine multispectral data allowed *Weitz and Head* [1999] to identify two units with mixed boundaries: a high-titanium basalt unit and a low-titanium basalt unit. *Heather et al.* [2003] use a technique detailed by *Heather* [2000] to map lava flows of the MHC. Six main units were mapped according to the UV/VIS slope, the strength of the 1 μm band and the estimated TiO_2 content.

[7] These studies made using the Clementine data provide constraints for all the volcanic features of the MHC. The domes are distributed on all types of lava flows and are spectrally identical to the surrounding mare, both high-titanium and low-titanium mare [*Heather et al.*, 2003; *Weitz and Head*, 1999]. No spectral differences were identified between the different type of domes (e.g., low/step domes). The domes are embayed by the basalts of the plateau that represent a later phase of highly effusive activity. These basalts are varied in composition and dominated by a high-titanium basalt unit [*Heather et al.*, 2003]. *Weitz and Head* [1999] proposed a complex formed by numerous dikes of