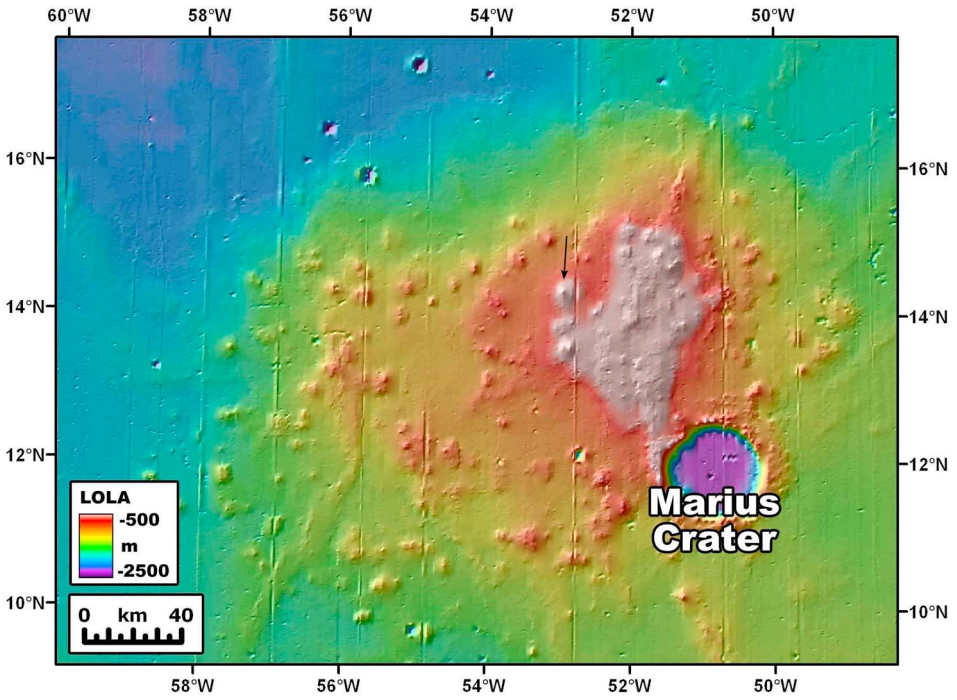

Figure 2. Topographic map of the Marius Hills volcanic complex using the Lunar Orbiter Laser Altimeter (LOLA) on board the Lunar Reconnaissance Orbiter mission (LRO). The along-track spatial resolution is about 20 m, and the cross-track resolution is approximately 1.6 km. The highest altitude of the plateau is localized in the central eastern part of the plateau that has been observed by M^3 only during OP2C (see section 2.2 for details). Figure 2 covers a wider area than Figure 1, especially toward the western part of the plateau. The arrow points to the dome discussed at the end of section 3.

various composition to explain the diversity of the domes and lava flows composing the MHC. *Heather et al.* [2003] proposed the same explanation but noted that a single source is possible if a long period of time is allowed for the titanium content of the magma to evolve. The formation of the domes may have occurred with a low effusion rate, a low temperature, and a crystallization of the magma [*Heather et al.*, 2003; *Weitz and Head*, 1999]. In Clementine multispectral images, the cones are spectrally different from the surrounding mare (and thus the domes), with lower reflectance and weaker mafic absorptions [*Heather et al.*, 2003; *Weitz and Head*, 1999]. Both authors suggest a fine-grained crystallization of the glassy lavas to explain the spectral properties of the cones. *Campbell et al.* [2009] studied the domes with Earth-based radar observations at 12.6 and 70 cm. The high circular polarization ratio of the domes was interpreted to result from blocky lavas that composed the domes beneath, at most, a few meters of regolith. The cones are not evident in the radar observations (likely due to the low spatial resolution of the observations of *Campbell et al.* [2009]).

[8] The spatial resolution has so far been limited to approximately 200 m/pix for spectral observations of the MHC. In the case of Marius Hills, this resolution allows the distinction of cones and domes. The MHC has been observed during the LRO and Kaguya missions, LROC and the HDTV camera provide very high spatial images but with no spectral information. Previous mineralogic interpretations of the MHC were mainly limited by the spectral resolution of available data. Galileo multispectral data and Clementine contain few channels and extend only to 1 μm. Ratios in the ultraviolet, visible and near infrared were used to distinguish cones from their surroundings and to map the different units of the plateau. However, a complete study of the 1 μm

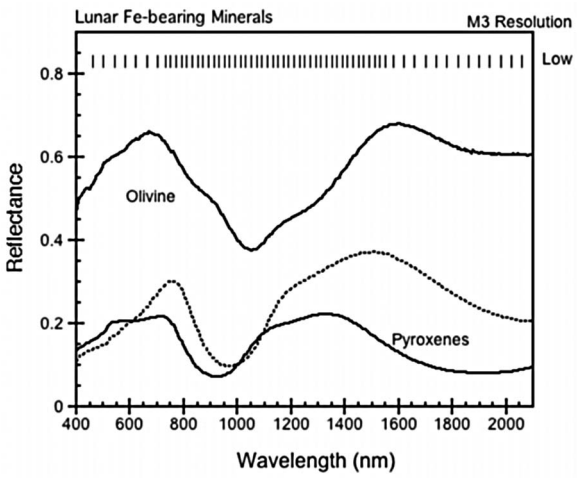

Figure 3. Reflectance spectra of the most common mafic minerals of lunar samples measured in Earth-based laboratory. Low-calcium pyroxene is the solid line, and high-calcium pyroxene the dashed line. The M^3 channels for the lower-resolution global mode (85 bands) are shown along the top.