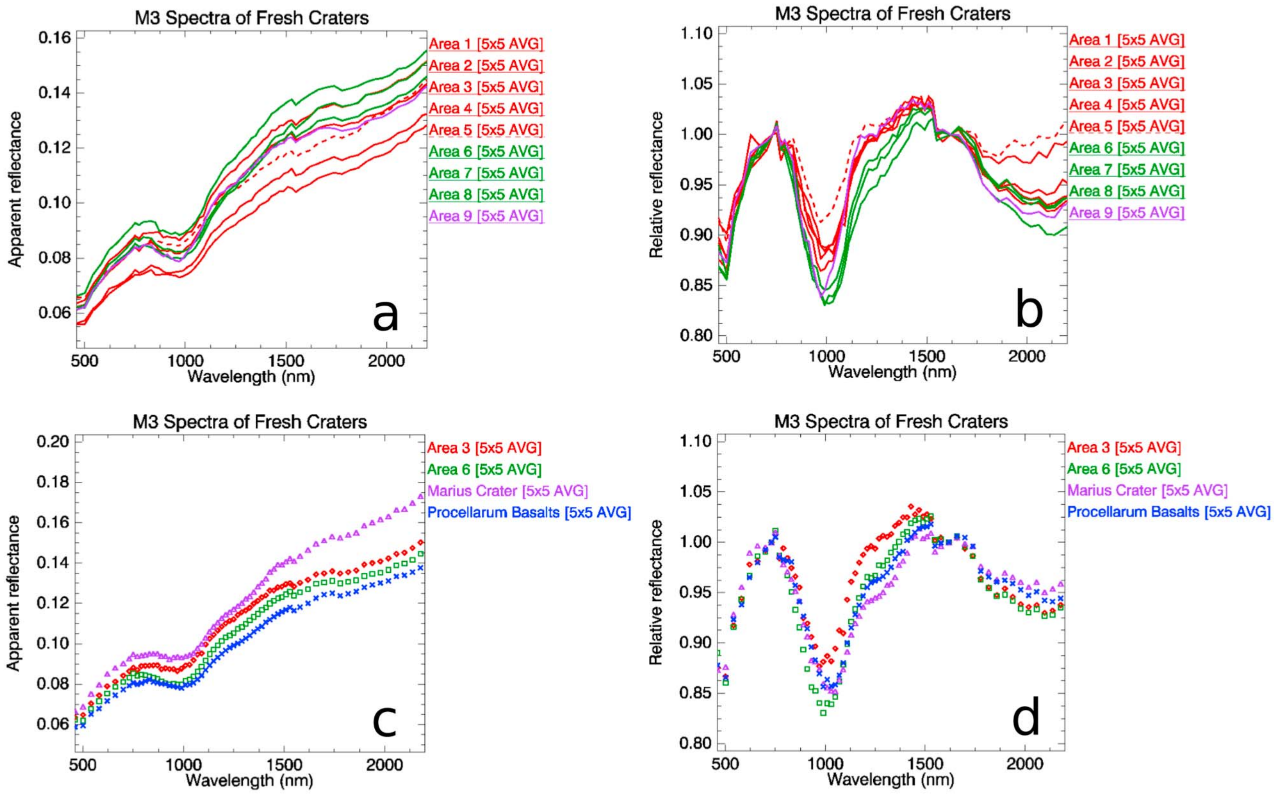

Figure 7. Spectra of fresh craters for the different mare areas defined in Figures 5 and 6. In Figures 7a and 7b, numbers correspond to the mare areas of Figure 5. In Figures 7c and 7d, the spectrum were taken at the location indicated by the white square in Figure 6. (a) The apparent reflectance of the nine areas, (b) the same spectra with a continua removed (see details in section 2.4 for the continuum removal). The spectra are divided in two groups: those in red with a weak IBD1000 (first mare unit); and those in green with a stronger IBD1000 (second mare unit) that exhibit a more important absorption around 1.3 μm, which is characteristic of an enhanced olivine component. Area 5 has very weak absorption at 1 μm, while area 9 has a very strong absorption. (c and d) Green spectra are inside Marius crater (box M in Figure 6), blue spectra are basalts outside the MHC (P box), red spectra are basalts inside the MHC (box O in Figure 6), and purple are olivine-rich basalts inside the MHC (box Y in Figure 6). Marius crater is rich in olivine as are mare regions outside the MHC.

units (i.e., composition and band strength): (1) variation in olivine content, (2) variation in plagioclase content, (3) variation in weathering, and (4) variation in opaque minerals such as ilmenite. It is possible that all of these options have occurred on the MHC. Compared to the thicker domes of the high-calcium pyroxene unit, the effusive thin olivine-rich flows would require a decrease in the silica content of the lavas. The spectra are consistent with this explanation. The origin of the cones as pyroclastic deposits [*Weitz and Head*, 1999; *Heather et al.*, 2003] is consistent with the presence of opaque minerals that could decrease the absorption band of the high-calcium pyroxene unit. In many cases, Lunar Orbiter images show that the domes and cones are embayed by lava flows [*Whitford-Stark and Head*, 1977]. Using M^3 data, it appears that the mare unit that embayed the domes and cones is the olivine-rich unit. Therefore, we can assume that the olivine-rich unit is younger than the high-calcium pyroxene unit. However, since both units are relatively old, there are unlikely to be differences in optical maturity over large areas because soils have had adequate time to optically mature. Area 9 of Figure 5 shows a different IBD1000 than its surrounding flows. The spectral properties of this region is emphasized in Figure 6 and in the spectra of Figure 7 that present the signature of a high-calcium pyroxene with deeper and shorter wavelength absorption than other regions with weaker IBD1000s. The first release of LOLA data from the LRO spacecraft located the highest point of the plateau very close to area 9 (see Figure 2). We investigated the Kaguya HDTV images and it seems that in the central eastern part of the plateau, domes were formed on top of other domes. The large dome that covers the area 9 might represent one of the latest domes on the MHC because it is built on top of older domes. If we assume a single source for the origin of the MHC [*Heather et al.*, 2003], the evolution of the magma (e.g., decrease of the silica content or decrease of opaques) could explain the stronger absorption band of area 9.

4. Properties of the Volcanic Domes and Cones

[28] The volcanic domes and cones of the MHC are identified in the M^3 images based on the description of *Whitford-Stark and Head* [1977] and the morphology in the inherently