10.1002/2013JE004537

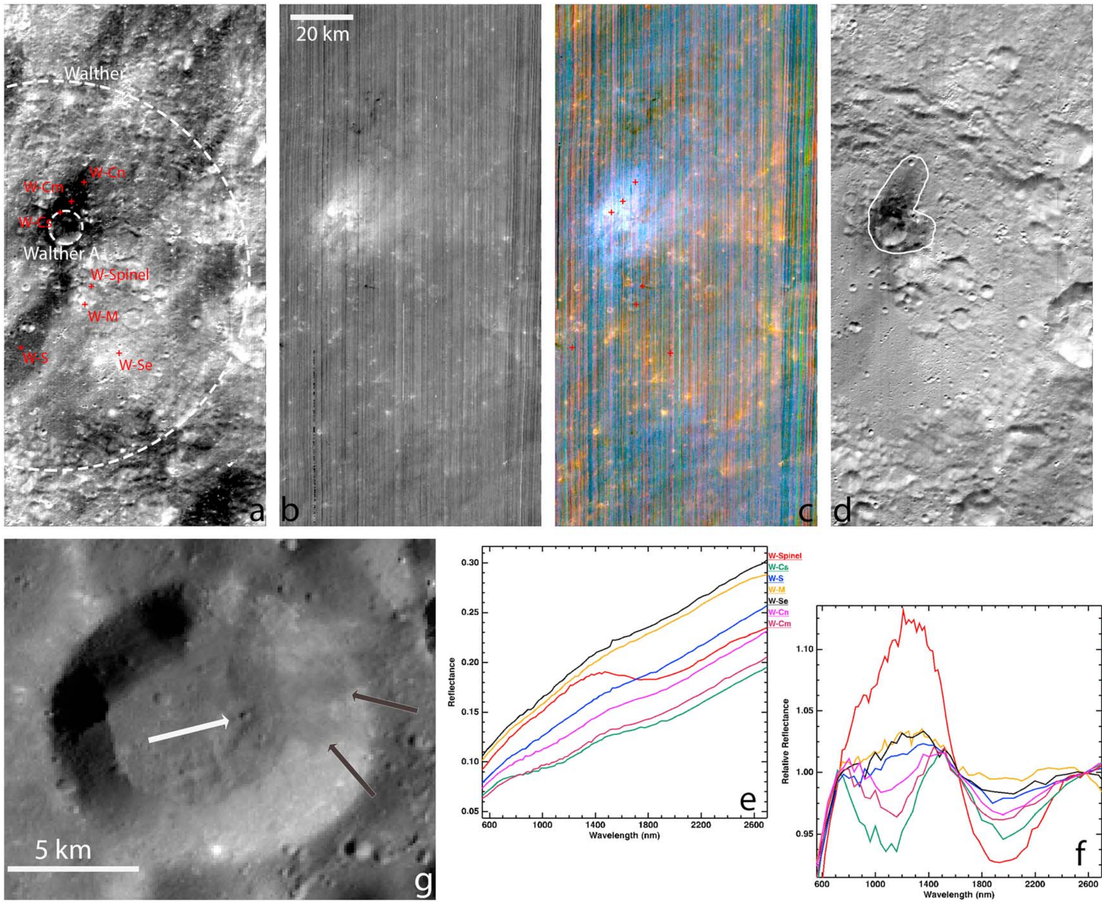

Figure 7. Walther A as viewed by M^3. (a) Reflectance at 0.75 μm, (b) IBD1000, (c) color composite (R = BD950, G = BD1050, B = R1250; see Table 1), (d) reflectance at 2.94 μm with the proposed outline of the DMDs by *Gustafson et al*. [2012], (e) the spectra of locations given in Figure 7a, and (f) the same spectra with a continuum removal applied. (g) An LROC-WAC image of the crater Walther A. White arrow points to a circular depression (crater or vent) that exhibits strong mafic absorptions, as well as the black arrows that mantle the walls of the crater Walther A. In Figure 7f, the continuum removal shows that the 1 μm band of W-Cs, W-Cn, and W-Cm are shifted to longer wavelengths, a characteristic of volcanic glass.

In Figure 7b, dark spots in the image are locations where no 1 μm absorptions are observed. Spectrum W-Spinel in Figures 7e and 7f exemplifies this observation and indicates that the deposit has a very strong 2 μm absorption and a weak-to-absent 1 μm absorption that is recognized as characteristic of spinel-rich materials [*Cloutis et al*., 2004]. These deposits are located along walls of the central peak complex of Walther. Of the two types of spinel discovered on the Moon by the M^3, this one more closely resembles the Mg-spinel first seen at Moscoviense [*Pieters et al*., 2011], rather than the regionally extensive very dark chromite-spinel deposits unique to Sinus Aestuum [*Sunshine et al*., 2010; *Yamamoto et al*., 2013]. We note that the Walther spinel deposits are spatially unrelated to the DMDs of Walther A and likely not associated with a pyroclastic origin.

5. Spectroscopic Properties, Classification, and Comparisons of DMDs Candidates

5.1. Contribution of Volcanic Glasses

The ability to detect the presence or absence of volcanic glass with M^3 provides a new tool for assessing a possible explosive origin of some small, dark, likely volcanic deposits on the Moon. Figure 8 directly compares the spectra of the DMDs candidates studied here, before (Figure 8a) and after continuum removal (Figure 8b), to highlight the variation in volcanic glass content of the different sites analyzed. In Figure 8a, the wavelength range extends to 2.9 μm to highlight the quality of the thermal correction, which shows no reddening of the slope.

From Figure 8a, it is noted that most M^3 spectra have relatively similar slopes. This characteristic is comparable to the slopes of laboratory spectra of volcanic glasses, in particular the green and orange glass sampled, respectively, at the Apollo 15 and 17 landing sites. Such spectral slopes could be influenced by variations in