Table 3. Summary of the Various Criteria Used to Define the Likelihood of the Candidates to be Pyroclastic in Origin[a]

	Morphology		Low Albedo		Absorption Bands Center Positions			
DMDs	Vent	Fractures	0.75 μm	2.94 μm	1 μm	2 μm	Glass Signature	DMD Likelihood
Buys-Ballot	No	No	Not with M3	Background average	1.0 μm	2.2 μm	No	Unlikely
Andersons	Possibly	Yes	Not with M3	Slightly darker	1.0 μm	2.2 μm	No	Possibly
Kopff	Possibly	Yes	The southern part appears darker	The southern part appears darker	1.05 μm	2.25 μm	No	Unlikely
Schluter	One good candidate	Fracture and rilles	Low albedo for the western deposit	Low albedo for the western deposit	1.12 μm 0.98 μm	2.08 μm 2.15 μm	Yes, western deposits only	Very likely (western candidate) Unlikely (others)
Birt E	One good candidate	Rilles	Low albedo	Background average	1.05 μm	2.03 μm	Yes, mixed with mare basalt signature	Very likely
Walther A	Not visible	No	Low albedo	Low albedo	1.10–1.15 μm	1.95–2.0 μm	Yes	Very likely

[a]Note that the morphological criteria come mainly from observations made by *Gustafson et al.* [2012].

(at short and long wavelengths), position of absorption band centers, and spectral resemblance to laboratory volcanic glass signatures. While the presence of all of these characteristics can help distinguish a pyroclastic DMD, the absence of one of them (e.g., morphology or volcanic glass signature) does not exclude a DMD origin. The presence of volcanic glass in a spectrum, however, is considered to be the strongest evidence in support of a pyroclastic origin for DMDs candidate.

1. Buys-Ballot, Anderson E and F craters: The possible pyroclastic deposits at Lacus Luxuriae do not appear distinctively darker than other nearby volcanic deposits in the 750 nm M^3 image. The fact that they appear darker in LROC may be due to viewing geometry and could be addressed with other data set. The proposed extent of the deposits clearly overlaps two mineralogically distinct compositional units, which appear to be more likely related to excavation and redistribution of underlying mare basalts. Our evidence suggests that the deposits of Lacus Luxuriae are unlikely to be pyroclastic in origin. Also, the deposits at Anderson E and F craters do not exhibit the spectroscopic characteristics that clearly identify them as pyroclastic. It appears that the entire basin of Freundlich-Sharonov contains patches of mare-like volcanism and that the dark Anderson E and F deposits could be associated with more regional volcanism in that area. However, the presence of possible volcanic vents aligned along floor fractures, as described by *Gustafson et al*. [2012], supports a pyroclastic origin for the Anderson E and F deposits.
2. Kopff: The M^3 data show that there is no evidence of a volcanic glass signature. Mafic signatures on the floor of this crater are associated with small craters, fractures along the floor, and low-albedo material in the inner rim. Although it is not possible to rule out that the small craters are vents, it appears more likely that there is an underlying layer of mare-like material that is exposed by these craters. The large crater located on the eastern part of the floor demonstrates that this layer might be very thin and could correspond to crystallization of impact melt that shows mineralogical variability. Other recent studies on similar floor-fractured craters with the M^3 data set [*Jawin et al*., 2013; *Souchon et al*., 2013] have shown that the DMDs can be easily isolated from the floor of the crater, which is not the case for Kopff. It is therefore suggested that the dark Kopff floor deposits are unlikely to be pyroclastic in origin.
3. Schluter: This floor-fractured crater has possible DMD deposits with morphological and spectral properties consistent with an origin as pyroclastic. In particular, the deposit located west of the central peak displays a vent-like structure that correlates well with the extent of mafic signatures and darker reflectance at 2.94 μm. Based on the characteristics of the 1 and 2 μm absorptions, it is unlikely that the region mapped as Area 1 contains pyroclastic DMDs. Although Area 2 exhibits different spectral properties than Area 1 (i.e., higher Ca-pyroxene content), it is not possible to rule out a DMD origin based only on the absence of volcanic glass signature. However, the dark deposits near the central peak exhibit volcanic glass signatures characteristic of pyroclastic DMDs and should be classified as such on the basis of this analysis.
4. Birt E: This dark deposit should be classified as a DMD on the basis of several compositional and morphological characteristics. There is evidence of a vent located at the end of the Rima Birt I rille surrounded by a concentric deposit. The area is darker in albedo at short wavelengths as seen both in LROC and M^3 images. The DMD itself can be spectrally distinguished with a signature of volcanic glass when compared to the surrounding lava flows.