Table 2. Summary of Spectral Parameters Used in the Analysis of the Lunar DMDs[a]

Name	Wavelengths Integrated (nm)	Continuum Boundaries (nm)
IBD1000	789–1308	749–1579
IBD2000	1658–2498	1408–2578
BD950	950	749–1579
BD1050	1050	749–1579
BD1250	1250	749–1579
BD1900	1900	1408–2578
BD2400	2400	1408–2578
R1580	1580	N/A

[a]IBD corresponds to the integrated band depth, BD to the band depth, and *R* to the reflectance. The reflectance at 1580 is used as a "neutral" reflectance where absorptions are limited.

Walther A, and the mare crater Birt E (also summarized in detail in *Gustafson et al*. [2012, Table 1]). The DMD at Mount Carpatus described in *Gustafson et al*. [2012] is not investigated with the M^3 due to unfavorable illumination conditions and limited spatial coverage. Other possible DMDs proposed by *Gustafson et al*. [2012, Table 2] are not investigated here because of their low likelihood of being DMDs (as acknowledged by *Gustafson et al*. [2012]) and their smaller sizes, which are not readily observable with the spatial resolution of the M^3. The M^3 data used for this analysis (Table 1) are divided into Optical Periods (OPs) that differ in terms of detector temperature and altitude of the spacecraft [*Boardman et al*., 2011]. To maximize the comparison of the DMDs compositions, observations from the same OP2C (Table 1) have been used for all analyzed targets.

To emphasize the mineralogical properties of the DMDs in a regional context, both individual spectral bands (e.g., reflectance at 0.75 and 2.94 μm to highlight albedo) and color parameter maps are used based on the spectral characteristics of mafic minerals. The primary parameter map used here is the Integrated Band Depth (IBD), which is used to highlight and identify major lunar minerals, including the chromium spinel-rich composition of the Sinus Aestuum pyroclastic deposits [*Sunshine et al*., 2010] and the olivine and pyroxene content of lunar soils [e.g., *Besse et al*., 2011]. The mathematical expression of the IBD at 1 μm is given in equation (1):

$$\mathrm{IBD1000} = \Sigma_{n=0}^{26}\left(\frac{R_{C1}(789+20n)}{R(789+20n)}\right) \quad (1)$$

where R_{C1} is the 1 μm continuum approximated by a straight line between 0.75 and 1.58 μm and R is the reflectance between 0.79 and 1.31 μm. Band depths (BD) are calculated for only one specific wavelength (i.e., not integrated over the whole absorption band). Reflectance (R) at 1.58 μm is used as a "neutral" reflectance where absorptions are limited. A summary of the parameters IBD, BD, and their respective continuum boundaries are presented in Table 2. In addition, continuum-removed spectra are used to emphasize the shape and position of absorption bands at 1 and 2 μm and to improve comparisons between units (Figures 3f, 4f, 5f, 6f, 7f, and 8b). The continuum is approximated by a straight line and divided from the original spectrum. The straight line is defined between 0.73 and 1.62 μm for the 1 μm band and between 1.62 and 2.58 μm for the 2 μm band.

4. Results From Sites of Proposed DMDs

In this section, the spectral characteristics of each of the five investigated sites are discussed on the basis of derived spectral parameter maps and continuum-removed spectra extracted from the M^3 data (Table 2).

4.1. Anderson E and F, and Buys-Ballot

Anderson E and F are two impact craters (28 km and 49 km diameter, respectively) located near the center of the farside Freundlich-Sharonov basin. The floors of both craters are bisected by fractures, both have dark deposits that appear to be volcanic in origin, and these dark units are proposed to be DMDs [*Gustafson et al*., 2012]. Buys-Ballot is an elongated pear-shaped crater (diameter of 55 km) with a mare-like flat floor that may have been formed as a result of an oblique impact by a mafic-rich impactor [*Schultz et al*., 1998]. Buys-Ballot crater is located 100 km north of the Anderson craters. Mare-like deposits extend further south into the Lacus Luxuriae maria, and *Gustafson et al*. [2012] suggest that DMDs mantling local highlands are associated with these mare deposits. The Lacus Luxuriae DMDs of *Gustafson et al*. [2012] are outlined in Figures 3a, 3b, and 3d by a white line. Together with the deposits at Anderson E and F, the association of low-albedo mafic deposits suggests also a volcanic origin for all these deposits as indicated by *Gustafson et al*. [2012].

Figure 3 shows M^3 albedo and parameter maps of these three deposits altogether. The IBD1000, shown in Figure 3b, is a measure of the strength of the 1 μm absorption and is a very good proxy for the mafic content