



Figure 4. (a–d) Spectral reflectance characteristics of the sedimentary deposits. Wavelengths shorter than $1.0 \mu\text{m}$ are not shown for the ratioed spectra since there are no neutral spectra in this wavelength region. Spectra in Figure 4a are offset; spectra in Figures 4b, 4c and 4d are scaled and offset for clarity. Numbers above the plots are in micrometers and indicate identifying absorptions. Figure 4a shows atmospherically and photometrically corrected numerator and denominator spectral pairs for the ferric hydroxysulfate, monohydrated sulfate, and polyhydrated sulfate; numerators are shown in black, and denominators are shown in gray from 0.5 to $2.5 \mu\text{m}$. Data not shown at around $1.0 \mu\text{m}$ (detector boundary) and $1.65 \mu\text{m}$ (known instrument artifact). Figure 4b shows polyhydrated sulfate ratioed spectrum (numerator/denominator) and lab spectra for candidate minerals melanterite $[\text{Fe}(\text{SO}_4)\cdot 7\text{H}_2\text{O}]$ and epsomite $[\text{Mg}(\text{SO}_4)\cdot 7\text{H}_2\text{O}]$. Figure 4c shows monohydrated sulfate ratioed spectrum and candidate minerals szomolnokite $[\text{Fe}^{+2}(\text{SO}_4)\cdot \text{H}_2\text{O}]$ and kieserite $[\text{Mg}(\text{SO}_4)\cdot \text{H}_2\text{O}]$. The kieserite spectrum presented here may have water contamination as evidenced by the absorption at $\sim 1.9 \mu\text{m}$. Figure 4d shows ferric hydroxysulfate ratioed spectrum and laboratory-created ferric hydroxysulfate $[\text{Fe}(\text{SO}_4)\text{OH}]$; the CRISM band with the minimum around $2.24 \mu\text{m}$ is at $2.238 \mu\text{m}$, which is the closest CRISM band to $2.4 \mu\text{m}$. The melanterite, szomolnokite, and ferric hydroxysulfate spectra are from laboratory experiments presented in the text and are also shown in Figure 5; the epsomite and kieserite spectra are from the CRISM spectral library.

ence in some locations of a sharp and relatively deep band at $2.238 \mu\text{m}$. The parameter to map the depth of this band was defined as follows:

$$BD2230 = 1 - \frac{R_{2.2318}}{\left(0.468 \times \frac{(R_{2.2120} + R_{2.1988})}{2} + 0.532 \times \frac{(R_{2.2583} + R_{2.2517})}{2}\right)}$$

where $R(\lambda)$ is the reflectivity at wavelength λ . This band depth parameter (BD2230) is now incorporated into the spectral summary parameters in CAT versions 6.5 and higher.

[9] Detections of specific minerals were confirmed by examining the wavelength range between 0.4 and $2.6 \mu\text{m}$ of the atmospherically and photometrically corrected hyperspectral data over each detection and comparing the spectra to laboratory-based mineral spectra resampled to CRISM band passes in the visible NIR wavelength range. As already noted, Figure 4 presents I/F spectra for end-members retrieved from CRISM data, along with the spectrally “neutral” spectrum used to generate ratio presentations. Also shown in Figure 4 are ratioed data for the L detector spectral range and laboratory spectra of likely analogs. The end-