Table 2. Parameter Names, Equations, and Intended Mineralogic Identifications for the CRISM Parameters Used Extensively Throughout This Study[a]

Parameter Name	Equation	Mineral of Interest
OLINDEX	R1695/((0.1 × R1080) + (0.1 × R1210) + (0.4 × R1330) + (0.4 × R1470))	Olivine
OLINDEX2[b]	(((R$_C$1054 − R1054)/R$_C$1054) × 0.1) + (((R$_C$1211 − R1211)/(R$_C$1211) × 0.1) + (((R$_C$1329 − R1329)/R$_C$1329) × 0.4) + (((R$_C$1474 − R1474)/R$_C$1474) × 0.4)	Olivine
HCPINDEX	100 × ((R1470 − R1080)/(R1470 + R1080)) × ((R1470 − R2067)/(R1470 + R2067))	High-Ca pyroxene
LCPINDEX	100 × ((R1330 − R1080)/(R1330 + R1080)) × ((R1330 − R1815)/(R1330 + R1815))	Low-Ca pyroxene
BD1900R	1 − ((R1908 + R1914 + R1921 + R1928 + R1934 + R1941) /(R1862 + R1869 + R1875 + R2112 + R2120 + R2126))	Hydrated mineral phases

[a]R#### indicates the measured, photometrically and atmospherically corrected reflectance value at that particular wavelength in nanometers. For example, R1695 indicates the corrected reflectance at 1.695 μm.
[b]R$_C$#### denotes the value of a point at a wavelength of #### nm along a modeled line that follows the average slope of the spectrum.

primary technique for removing residual atmospheric signals and systematic artifacts inherent to the instrumentation [*Mustard et al.*, 2005, 2009; *Ehlmann et al.*, 2009]. This technique divides a spectrum of interest by a featureless (or "neutral") spectrum, which suppresses residual instrumental and atmospheric artifacts. The neutral spectra are taken from regions that exhibit no unique spectral features indicative of crystalline mineralogies. The net result is the enhancement of diagnostic spectral features in the numerator spectrum. While spectral ratioing has the potential to introduce features inherent to the denominator spectra (e.g., inverse mineralogic absorption features), care has been taken to ensure that only featureless denominator spectra were used in this study. The utility of ratioing orbital near-infrared spectra to better identify mafic mineralogies was first shown using OMEGA data [*Mustard et al.*, 2005]. When possible, the numerator and denominator spectra are also collected from within the same columns in individual CRISM scenes. This technique suppresses artifacts associated with the design of the CRISM sensor's pushbroom array [*Mustard et al.*, 2009]. Spectral averages were utilized throughout this study to decrease the presence of spectral artifacts.

[14] Parameters for each CRISM multispectral tile and targeted observation were analyzed, with the most attention being paid to OLINDEX, HCPINDEX, LCPINDEX, and BD1900, which are used to identify the presence of olivine, high-calcium pyroxene, low-calcium pyroxene, and narrow 1.9 μm absorption features of adsorbed or condensed H_2O, respectively (Table 2) [*Pelkey et al.*, 2007]. These parameters indicate the presence of the most common mafic minerals found on Mars as well as alteration signatures associated with aqueous weathering. During the analysis, it was determined that OLINDEX performed poorly in areas with a strong spectral slope [*Salvatore et al.*, 2009]. The NIR blue slope, originally discovered by OMEGA, is pervasive across much of the study region and severely complicates the identification of olivine using the OLINDEX parameter. OLINDEX is designed to measure the depth of olivine's broad absorption centered near 1.0 μm based on a horizontal line indicating the spectrum's reflectance at 1.695 μm (Figure 2a and Table 2). This parameterization is

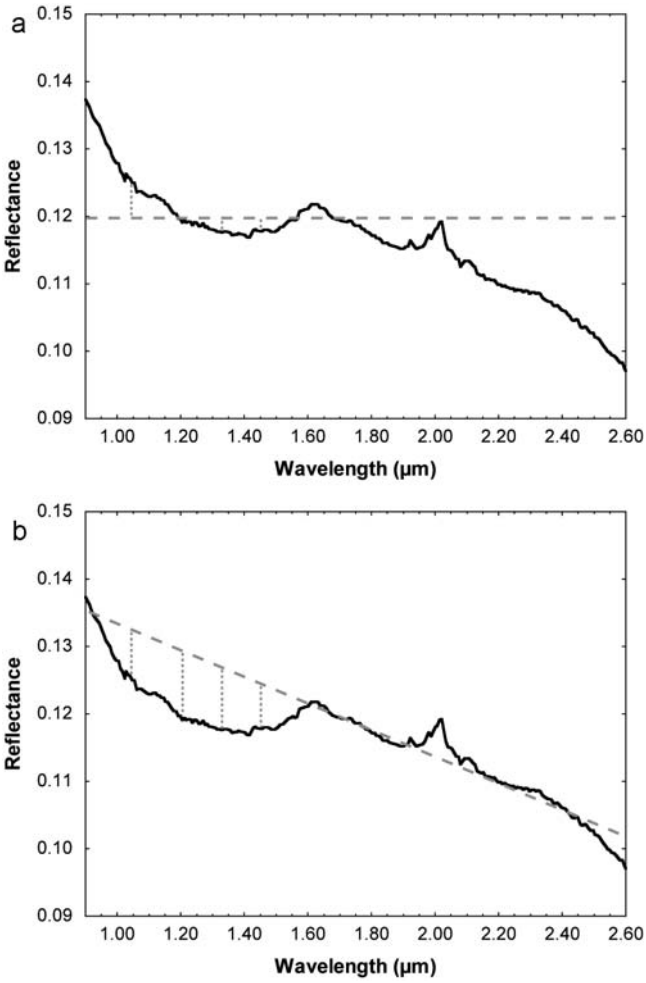

Figure 2. Comparison of the (a) original OLINDEX and (b) OLINDEX2. Olivine is only correctly identified when the slope of the spectrum is accurately modeled. The spectral peak near 2.00 μm is an anomaly created by imperfections in the atmospheric correction.