# Guide for HySpex and oreXpress spectral parameters

## Introduction

Hyperspectral image cubes are information-rich, containing hundreds of data points across millions of pixels. To condense this information into a more-interpretable form, it is common to parameterize certain aspects of the spectra that are known to represent compositions of interest if present. Parameterizations of spectral features are called *spectral parameters*. Spectral parameters can be combined thematically into RGB images, called *browse products*, to visualize compositional variation across a surface. Below is a guide to the spectral parameters calculated for the HySpex and oreXpress data for the RAVEN project. The parameters calculated here are modeled closely after the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) spectral parameters described in Viviano et al. (2014).

*BD parameters:* Parameters beginning with “BD” capture a band depth. The value is positive an absorption feature is present and is calculated such that the value is an approximate percentage depth of the feature in terms of relative reflectance. Thus, a value of 0.05 for a BD parameter means an approximately 5% deep absorption band below the continuum. Conversely, a value of -0.05 for a BD parameter would mean an inverted band depth, or peak, of approximately 5% above the continuum reflectance value.

*D parameters:* Parameters beginning with “D” are spectral shoulders. These are highly asymmetrical absorption features where the reflectance values “drop off”. Similar to BD parameters, D parameter values represent approximate percentages below (or above) the continuum reflectance value.

*Index parameters:* Parameters containing the word “INDEX” are broad composite bands, typically associated with mafic minerals. INDEX values represent a weighted average of percent depth below (or above) the continuum. Positive values indicate the presence of the indicated mineral; for example, positive values for LCPINDEX2 indicate presence of low-calcium pyroxene.

Further details on the individual parameters are recorded in Tables 2 and 3 of Viviano et al. (2014).

For the oreXpress point spectrometer, images cannot be created in the same way as with the HySpex data. Instead of images, bar charts for each spectral parameter were calculated to summarize the compositional information contained in the spectra. Included with the oreXpress parameters is a folder called “/Library”. This folder contains parameters calculated on spectra from the USGS spectral library to set expectations for parameter values and what values are of a meaningful magnitude. When analyzing these bar charts of spectral parameter values for point spectra, keep in mind that, in general, parameter values can be interpreted as percentages relative to the spectral continuum with positive values indicating the presence of an absorption feature.

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## SWIR Parameters

*Calculated using wavelengths between 1000 and 2500 nm*

*Key:*

*Parameter:browse product*

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OLINDEX3:MAF

LCPINDEX2:MAF

HCPINDEX2:MAF

BD1400:CHL

BD1900\_2:HYD

BD1900r2:HYS ,PHY

BD2100\_2:HYD

BD2165:PAL

BD2190:PAL

BD2210\_2:PAL

BD2250:HYS

BD2290:PFM

BD2355:PFM

BDCARB:CR2

D2200:PHY

D2300:PHY, PFM

IRR2:CHL

ISLOPE:CHL

MIN2250:HYS

MIN2295\_2480:CR2

MIN2345\_2537:CR2

R2529:FAL

R1506:FAL

R1080:FAL

SINDEX2:HYD

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## VIS Parameters

*Calculated using wavelengths between 400 and 1000 nm*

*Key:*

*Parameter:browse product*

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R637:TRU

R550:TRU

R463:TRU

BD530\_2:FM2

BD920\_2:FM2

RPEAK1:used for BDI1000VIS

BDI1000VIS:FM2