**Introduction**

- The Mastcam instruments on the MSL Curiosity rover can acquire images at up to 12 distinct filter wavelengths [1,2,3,4], allowing 12-point visible/NIR reflectance spectra (445-1012 nm) to be derived from averaged ROI values within the image [5].
- Unique spectral features allow different materials to be identified within images, often using a small subset of Mastcam filters. This parameterization can aid in mapping and reconnaissance, especially for small-scale exposures and/or uncommon materials, such as localized alteration.

**Fe-Sulfate**

- In Marias Pass, multispectral observations documented small-scale exposures spectrally consistent with a ferric oxide or sulfate. Chemistry by LIBS is consistent with jarosite or a similar mineral [6].
- This material is distinguishable from surrounding Stimson by the strong NIR absorption that results in higher 751/867 nm filter ratios. A search of surrounding strata using these two filters revealed a lack of broad exposures.

**Potential Fe-Ni Meteorites**

- Iron-nickel meteorites have been observed several times by this and other missions [8,9,10] and can serve as markers of previous environmental conditions by their degree of alteration [11].
- Using decorrelation stretches and ratio parameter maps based on the positive NIR slope of these materials, we identified several additional candidates within the multispectral dataset.

**Fe-Oxide**

- Mastcam has observed hematite spectral signatures in the Murray bedrock since approximately sol 1160, consistent with ChemCam passive and CRISM orbital spectra [12,13,14].
- Additional small-scale features with stronger ferric-oxide-like spectral features have been observed with a variety of morphologies.
- These may be areas where liquid water moving through fractures mobilized and reprecipitated Fe\(^{3+}\) from the hematite in the surrounding bedrock.

**Grayish Layers or Coatings**

- Isolated rock surfaces observed occasionally since approximately sol 1524 have exhibited unusual spectra characterized by less red visible slopes, decreased or absent 867-1012 nm upturns, and shorter reflectance peaks resulting in negative 676-751 nm spectral slopes.
- These spectral characteristics may be consistent with magnetite (perhaps from reduction of hematite), or perhaps a ferrous sulfate mineral.

**Summary**

- Small-scale exposures of alteration are often poorly characterized by and only weakly recognizable in RGB Bayer imaging, but can be mapped with Mastcam by their NIR reflectance properties.
- Other exotic materials with distinct reflectance behavior, such iron-nickel meteorites, are likely overlooked when their morphologies are not sufficiently noticeable. Mastcam multispectral imaging can distinguish these materials from local bedrock.

**References**