

**Title:** Correlating Mastcam multispectral data and rock morphology to understand potential links between ferric spectral features along Vera Rubin Ridge in Gale Crater, Mars

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Over the past year, the Mars Science Laboratory (MSL) Curiosity rover has been investigating the chemistry, morphology, and stratigraphy of Vera Rubin Ridge (VRR), an ~6.5 km long by 200 m wide mesa-like topographic feature that rises ~10 m above the surrounding slopes of Mt. Sharp. Since the beginning of the mission, VRR has been a location of interest to the MSL science team because of its erosional resistance and strong 860 nm absorption associated with and attributed to crystalline hematite seen from orbit in Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) data. Now, VRR has been thoroughly analyzed by both orbital and rover scientific instruments.

Vera Rubin Ridge has been divided into two stratigraphic members, referred to as the Jura and Pettegrove Point members. Based on visible wavelength imaging from the Mastcam instrument onboard the rover, the bedrock along VRR can be divided into two groups of rocks based on color, the “gray” and “red” materials. The “red” material is ubiquitous throughout both the Pettegrove Point and Jura members. Small (~10s of meter diameter) deposits of the “gray” material visited by Curiosity are almost exclusively found within the Jura member, although orbital images show they may be present in the Pettegrove Point member in locations east of Curiosity’s traverse. Enhanced Mastcam color images show that the “gray” material is typically comprised of massive laminated bedrock with a light gray to light blue false color. In HiRISE false color mosaics, the “gray” material is identified by bright blue patches in local topographic lows. The “red” rocks have textures that range from massive laminated bedrock to eroded knobby bedrock with numerous diagenetic features.

This project aims to examine surface multispectral data to link variable ferric and ferrous features to rock morphologies, looking at the strength, position, and presence or absence of spectral features in the Mastcam filters. The multispectral data shows that the “gray” material has very shallow ferric features or none at all, whereas the “red” material has moderate to strong ferric absorptions. Correlating the spatial variations of spectral features to textural observations is providing new insights into the physical and mineralogical processes that are controlling the topography and formation of Vera Rubin Ridge.

**Optional Plain Language summary:** Over the past year, the Curiosity rover has been investigating Vera Rubin Ridge. Before landing in Gale Crater, 6 years ago, this ridge excited and intrigued scientists because the orbital data suggested the ridge was rich in hematite, a mineral very important to understanding the past potential for Gale Crater to have once had liquid water. Now that the rover has finally arrived at the ridge, we are using the Mastcam instrument to take visible color images as well as images in many longer wavelengths that the human eye cannot see. It is the data in these wavelengths that provides us with clues as to what minerals might be present in the rocks. In this presentation we explore how the multispectral data show how the data varies across the part of the ridge that the rover has explored and how that correlates to properties of the bedrock.