Extending CRISM Spectral Coverage in Gale Crater Using THEMIS-VIS and HiRISE

K. A. Bennett¹, J. F. Bell III¹, T. H. McConnochie², and M. J. Wolff³

¹School of Earth and Space Exploration, Arizona State University, Tempe AZ; ²Department of Astronomy, University of Maryland; ³Space Science Institute, Boulder CO. Contact: Kristen.A.Bennett@asu.edu

Introduction

• Gale Crater (landing site for MSL) contains phyllosilicate- and sulfate-bearing materials on and near its central mound [1]
• We investigate whether MRO’s High Resolution Imaging Science Experiment color images (HiRISE color) [4] and the Mars Odyssey orbiter’s Thermal Emission Imaging System Visible Imaging System (THEMIS-VIS) [2,3] can be used to identify clay and/or sulfate deposits at finer spatial scales and/or in areas not yet measured by CRISM

Methods

• We converted HiRISE and THEMIS-VIS radiance data to radiance factor (I/F), then to estimated Lambert albedo by dividing I/F by the cosine of the average solar incidence angle
• We investigated parameters such as color ratio and visible spectral curvature to search for potential correlation between visible-wavelength color properties and the presence of phyllosilicates or other mineral phases that have been detected in the near infrared

Results

• Olivine bearing dunes and clay-bearing units are separated on a plot of HiRISE 900/700 nm to 700/500 nm color ratio data
• Trends in HiRISE color ratio data follow trends in laboratory convolved mineral spectra
• We identified a potential new clay-bearing unit that is closer to MSL’s landing ellipse than the phyllosilicate-bearing trough

Conclusions and Future Work

• Possible HiRISE parameters (900/700 nm band ratio and 900/700 nm vs. 700/500 nm) may provide ability to qualitatively link clay-bearing units identified in CRISM data to color units identified in HiRISE 3-point spectra
• THEMIS-VIS 4-band visible color data are potentially useful, but coverage in MSL field site still somewhat sparse and shorter-wavelengths compared to HiRISE color data may not enable as strong a spectral correlation to near-IR CRISM data
• Future work within Gale and elsewhere will include more extensive analysis of HiRISE color images, a detailed analysis of THEMIS-VIS color data, assessment of potential correlations between CRISM-detected sulfate materials and HiRISE, THEMIS-VIS color

References