INTRODUCTION

The Miniaturized Variable Pressure Scanning Electron Microscope (MVP-SEM) project, funded by the NASA Planetary Instrument Concepts for the Advancement of Solar System Observations (PICASSO) Research Opportunities in Space and Earth Science (ROSES), will build upon previous miniaturized SEM designs for lunar and International Space Station (ISS) applications [1, 2] and recent advancements in variable pressure SEM's (e.g., 3) to design and build a SEM to complete analyses of samples on the surface of Mars using the atmosphere as an imaging medium. By the end of the PICASSO work, a prototype of the primary proof-of-concept components (i.e., the electron gun, focusing optics and scanning system) will be assembled and preliminary testing in a Mars analog chamber at the Jet Propulsion Laboratory will be completed to partially fulfill Technology Readiness Level 5 requirements for those components. The team plans to have Secondary Electron Imaging (SEI), Backscattered Electron (BSE) detection, and Energy Dispersive Spectroscopy (EDS) capabilities available in the MVP-SEM.

SCIENCE GOALS & REQUIREMENTS

It is the desire of the MVP-SEM team to engage the planetary science community in setting the science goals and requirements of the instrument. The original defined science requirements were presented in [4], were fairly general, and focused primarily on petrology. Refined requirements are expected to yield greater constraints on the instrument and its capabilities. For example, data needs for the calculation of stoichiometry and the identification of reduced or oxidized forms of minerals will require greater precision for EDS for specific elements. The team is looking for inputs from the planetary science community to define a data set that will be useful to the majority of the community. Therefore, all contributions are welcome. A refined set of requirements for the instrument will be produced from the gathered information.

A Science Traceability Matrix (table below) shows the flow-down of the NASA Strategic Goals to the functional requirements of the instrument. Many of the Mars Exploration Program Analysis Group (MEPAG) investigations require both geomorphology and geochemistry of the samples. Remaining testing to define the capabilities of the instrument include EDS sensitivity in the CO₂-rich atmosphere and the amount of beam current needed at the sample for precise results.

FUTURE WORK

At the end of this PICASSO effort, the team will continue development of the instrument through the Maturation of Instruments for Solar System Exploration (MatISSE) ROSES opportunity.

What would YOU study if you had a SEM on Mars?

Let us know!

www.surveymonkey.com/r/VBNZNDZ

- No personally identifiable information (PII) required.
- Any PII voluntarily provided will be deleted from contributions.
- The contributed information will not be published.
- The goal is to identify useful information for the planetary community that can be obtained via specific SEM studies or instrument requirements.

REFERENCES