Preliminary Findings of the Mars Exploration Student Data Teams using CRISM Data. H Lineberger[1], A Annex[1], S Tsang[1], M Jones[2], M Tobias[2], B. Grigsby[3], E Malaret[4], K Seelos[5], S Murchie[5], and D Turney[5], [1] Durham Academy Upper School, Durham, NC, [2] Durham Public Schools, Durham, NC, Arizona State University, Mars Space Flight Facility, Tempe, AZ, [4]Applied Coherent Technology, Herndon VA, [5]Johns Hopkins Applied Physics Laboratory, Laurel, MD.

Introduction: In the last decade, spectroscopic studies of Mars have provided much information regarding the composition of the Red Planet. It is increasingly evident that the primordial mafic character of the Martian crust has been modified by the actions of liquid water. Perhaps the most exciting evidence of a water-rich past is the presence of hydrated phyllosilicates (clays) on the surface of Mars. First definitively identified by the OMEGA spectrometer [1] and confirmed by CRISM data, these clays may represent a time approximately 4 billion years ago when surface waters may have flowed freely on Mars [2]. Using these spectral data sets and by integrating analyses of images acquired by the THEMIS, HRSC and HiRISE cameras, detailed studies of areas where these clay minerals occur are underway [2] [3] [4] [5] [6]. MESDT (Mars Exploration Student Data Teams), an outreach project created by the Mars Education Program at Arizona State University, offers high school students a unique chance to do similar studies in an area of Terra Tyrrhena, where the occurrence of clay minerals have been documented. Guided by MESDT coordinator Brian Grigsby and CRISM team members, MESDT teams from four high schools located across the United States have begun to analyze the geology, composition and stratigraphy of a portion of Terra Tyrrhena.

Methodology: During the fall of 2007, the first components of a global spectral map being assembled from CRISM multispectral data were released to the MESDT teams. Each team received one and one half "tiles" of 256 pixel/deg (~230 m/pixel) 72-channel data. Each tile represents an area of about 90,000 km^2 of the Martian surface. Spectral data on each tile are shown as 10 km wide strips that are actually thousands of kilometers long. This data has been processed to remove atmospheric interference. Spectra for each pixel are then converted to sets of "summary parameters" [7]. Each summary parameter is defined by a spectral absorption characteristic of certain minerals. Through the use of ACT/REACT software provided to the MESDT teams, summary parameters can be manipulated by assigning colors to different mineral indicators. The MESDT team members then use the summary parameter composite maps to target specific areas of geological and compositional interest. Such targeted areas have been submitted to the CRISM team along with scientific justification. During the next phase of the project, MESDT targets will be observed at the highest resolution of the CRISM instrument (18 meters per pixel in 544 colors) so that the geologic context of targets can be studied in detail. Effectively, MESDT students have been allowed to proceed much like any member of the CRISM science team. In fact, feedback provided by MESDT students drove recent changes in ACT/REACT software that allows for the reloading of previous sessions together with all data layers and map viewing parameters, allowing for more effective data interpretation.

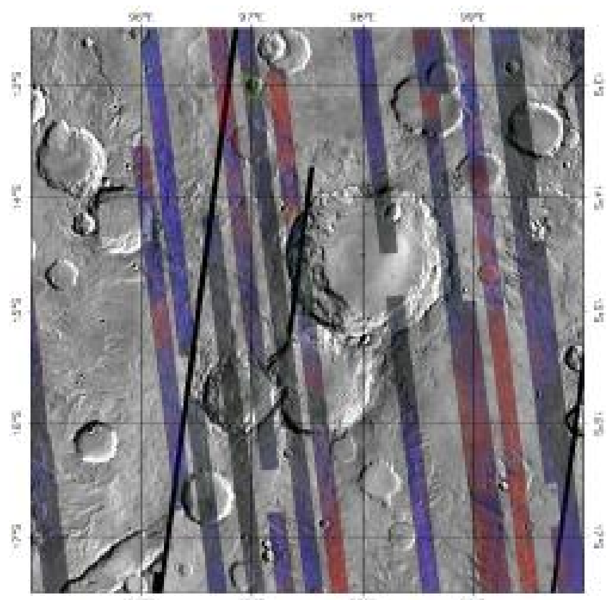

Fig 1: Tile 750, Lat 10.00S, Long 99.00E Olivine summary parameter shown in red, pyroxene in blue, phyllosilicates in green (Credit: NASA/JPL/JHUAPL/Applied Coherent Technology)

Preliminary Findings: Materials in the study area are dominated by minerals of igneous origin, olivine and pyroxene (both low and high calcium), and by phyllosilicate minerals (clays). The igneous minerals seem to correlate with materials that occur in lower elevations of intercrater plains and on the floors of craters. Much of this igneous material appears to be bedrock, especially when it occurs in the floors of modified craters. This hypothesis is suppored by proximity of the region to the large volcano, Terra Tyrrhena, and by THEMIS imagery [8], which shows higher temperatures characteristic of bedrock (see fig. 2 below) within many of the craters in the region. Phyllosilicates seem to correlate with ejecta deposits around medium sized craters and as layers in the walls of larger craters. This suggests that impacts may have penetrated clay-rich layers at depth. Such distribution of clays seem to be consistent with what is observed in other regions of Mars where clays occur, such as Holden Crater [4], Marwth Vallis [6] and Libya Montes [3]. In addition, there is spectral evidence indicating that occurrences of clays might be associated with tectonic features, such as the graben in the southwestern corner of tile 750 (see Fig 1).

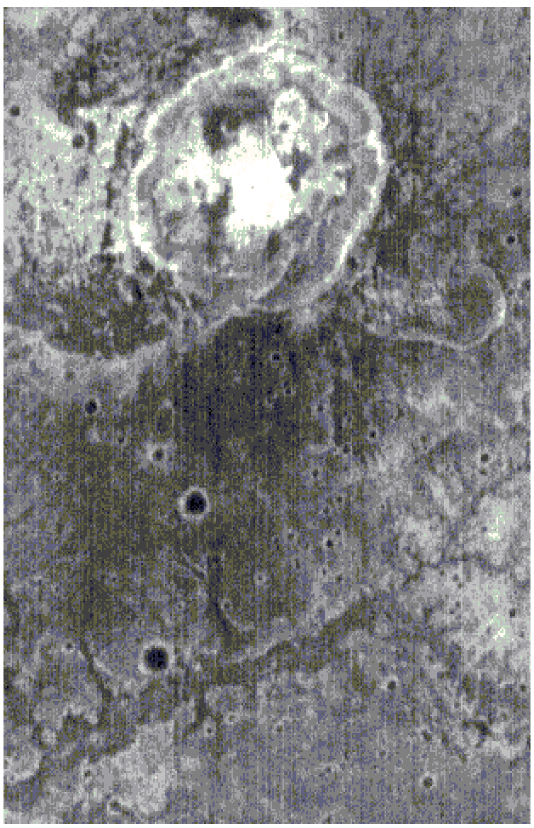

Fig 2: THEMIS nighttime IR image showing a potion of tile 750. Note the high temperature of materials in the crater at top (igneous bedrock?) and the channel feature at bottom. Image Credit: THEMIS Public Data Releases, Mars Space Flight Facility, Arizona State University)

Future Work: As of this writing, MESDT teams are uploading selected targets to the CRISM team at JHU/APL. Once targets are acquired, MESDT will continue as the four teams interpret the detailed geologic nature of their assigned areas.

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