MINERALOGICAL INVESTIGATIONS IN EAST CANDOR CHASMA, VALLES MARINERIS, MARS AND IMPLICATIONS. Mahima Singh* and V.J. Rajesh, Department of Earth and Space Sciences, Indian Institute of Space Science and Technology, Thiruvananthapuram- 695 547, India (*Corresponding author: <snghmahima@gmail.com>).

Introduction: Candor Chasma is one of the largest canyons in the Valles Marineris region of Mars and has been considered into two division: East Candor Chasma and West Candor Chasma [1]. With the several proposed mechanisms for the origin of canyon features on Mars, which is an unclear topic till date, it will be of much importance to investigate the mineralogy of the regions with the similar features in order to add the scientific information to the existing knowledge. Compact Reconnaissance imaging spectrometer for Mars (CRISM) datasets on-board Mars Reconnaissance Orbiter (MRO) has been proved to be the most informative as far as mineralogy is concerned at the maximum resolution limit. The results have proved the presence of suphates, hydrous sulphates and iron oxides mostly in interior layered deposits (ILDs) in different regions on Mars [1, 2]. The mineralogy of West Candor Chasma has been investigated extensively; and polyhydrated sulphates, pyroxenes and iron oxides are reported using CRISM datasets [1]. Here we are reporting the mineralogical assemblages identified using MRO-CRISM datasets in East Candor Chasma.

Geological Background and Methodology: Candor Chasma is well known for polyhydrated sulphate deposits and particularly, West Candor Chasma have been studied quite in detail for its mineralogy (Fig. 1) [1, 2, 3]. CRISM datasets were processed based on the methodology explained in 1, 4 and refrences therein and spectral results were obtained for mineralogical interpretation of the area. Obtained reflectance spectra from the area have been compared with the mineral spectra from CRISM spectral library.

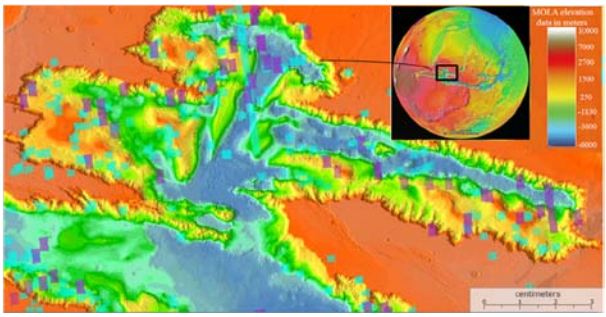

Figure 1. Location of Candor Chasma on Mars with East and West Candor Chasma. This study focuses on the mineralogical investigations in East Candor Chasma.

Results: We have studied the mineralogical variation present in East Candor Chasma region of Valles Marineris of Mars using MRO-CRISM datasets. The major mineralogical groups identified from the area belongs to sulphate and carbonate group of minerals. Interior layered deposits show the composition of palagonite (red) with the absorption bands at 1.46, 1.96 and 2.52 µm which are exactly matching with the palagonite spectrum of CRISM spectral library (Fig. 2). Calcite (sky-blue) was identified based on the absorption bands at 1.44, 1.6, 1.96, 2.36 and 2.52 µm, which are matching well with the full spectral profile of calcite from CRISM spectral library. Hydromagnesite (black) was confirmed by the presence of characteristic absorption bands at 1.4, 1.44, 1.46, 1.6, 2.36, 2.52 µm and comparison was made with the hydromagnesite spectrum of CRISM spectral library. Kieserite was confirmed based on the absorption band at 1.6 µm.

Further, chasma floor also showed the variations in the mineral compositions and confirms the minerals calcite (violet) with the main absorption bands at 2.32, 2.52 µm which are exactly matching with the calcite spectrum of CRISM spectral library, diaspore with the absorption bands at 1.88 and around 2 µm (green), and vermiculite with the peculiar absorption bands at 1.52, 1.98, 2.32 and 2.4 µm (black) (Fig. 3). Absorption bands at 3.28, 3.44 and 3.78 µm which are characteristic of calcite were also identified as confirmation of carbonates could only be made if the absorption bands are also present in 3.1-3.9 µm region of electro-magnetic spectrum (Fig. 4).

Summary and Conclusions: Interior layered deposits and plateau regions in the East Candor Chasma are found to be rich in carbonates and sulphates. These mineral species would have been formed either through deposition by surface alteration or during the weathering of the plateau material. Presence of carbonates in the area suggest the activity of water/hydrothermal activity. Additionally, sulphates and carbonates require liquid water at least at 2-3 km depth to form. Therefore, presence of these minerals helps in identifying the hydrologic conditions in the area. Sulfates detected in the studied area require the presence of liquid water to form by precipitation,

either in an intermittent lacustrine environment or by hydrothermal fluid circulation.

References: [1] Murchie et al. (2009) *Journal of Geophysical Research*: 114. [2] Mangold et al. (2008) *Icarus* 194, 519–543. [3] Gendrin et al. (2005) *Science* 307, 1587. [4] Ehlmann et al. (2009), *Journal of Geophysical Research: Planets*, 114(E2).

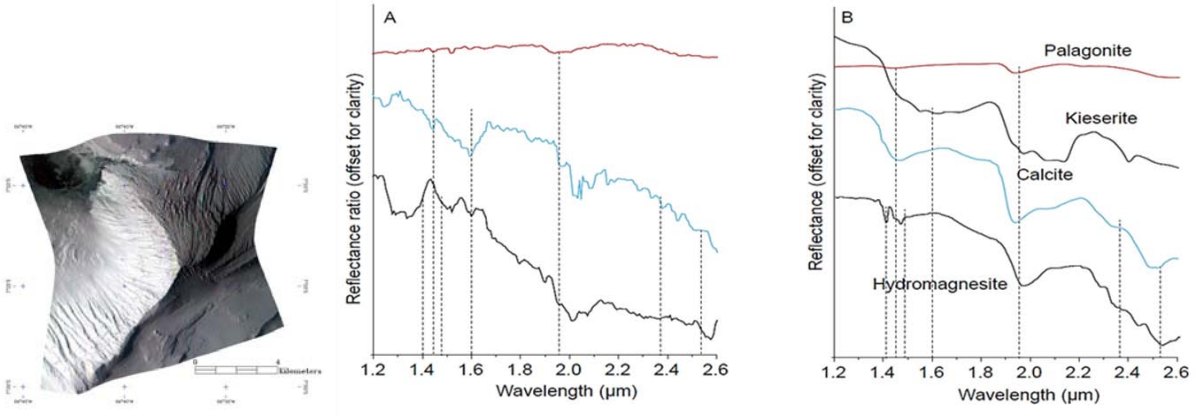

Figure 2. (A) Reflectance spectra of different mineral species from interior layered deposits of East candor Chasma, namely palagonite, kieserite, calcite and hydromagnesite (CRISM scene frt00010e3e_07_if165l_trr3). (B) Reference spectra from CRISM spectral Library for the identified minerals.

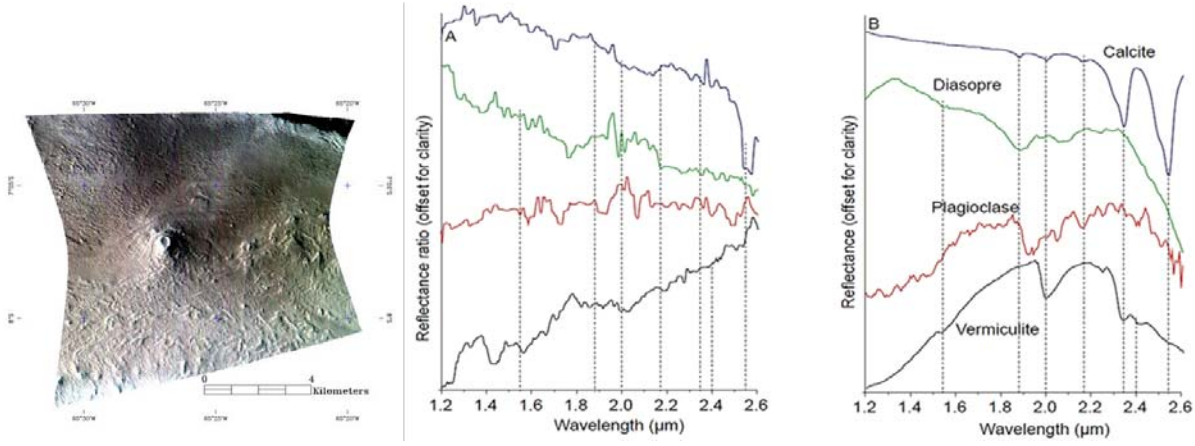

Figure 3. (A) Reflectance spectra of different mineral species from floor of East candor Chasma, namely calcite, diaspore, plagioclase and vermiculite (CRISM scene frt000112a5_07_if164l_trr3). (B) Reference spectra from CRISM spectral Library for the identified minerals.

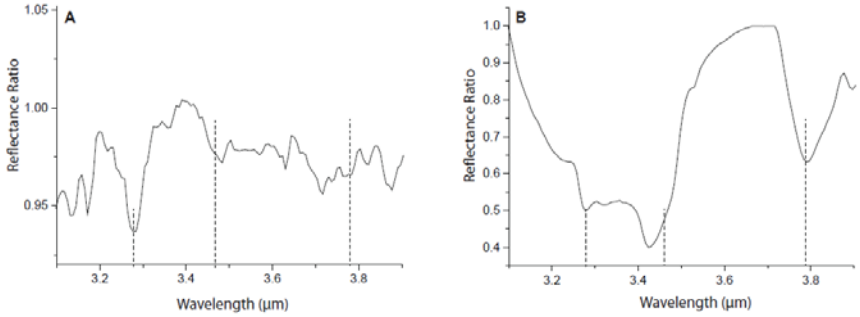

Figure 4. (A) Reflectance spectra of calcite in 3.1-3.9 μm region (CRISM scene frt000112a5_07_if164l_trr3). (B) Reference spectra from CRISM spectral library of calcite.