Introduction Many studies have been carried out by the researchers for various region of Valles Marineris and has revealed evidence for the presence of sulphate deposits namely the Interior Layered Deposits (ILD). The present study aims at the identification of mafic minerals High Calcium Pyroxene (HCP) and Phyllosilicate minerals of Melas chasma region of Valles Marineris by using CRISM datasets. The spectra and the mineral distribution maps are derived using the spectral summary parameters which helps to understand the past geologic events ultimately bringing out the origin and evolution of Valles Marineris. The Morphological features of Valles Marineris are compared with the CRISM as well as the HiRISE Data. The Digital Elevation Model (DEM) is derived using the Mars Orbiter Laser Altimeter (MOLA) data which shows that the depth varies from 3km to 7km. For the present study, Melas Chasma is taken for geochemical and mineralogical analysis using remote sensing data. The mafic minerals and phyllosilicate mineral distribution are derived which delineates dominance of pyroxene and the presence Mg-OH phyllosilicates indicating the volcanic origin and the processes of low grade metamorphism respectively.

Study Area Valles Marineris lies between -2° to -18° S latitude and -26° to -108° W longitude extending about 4000 km in length, 200 km in width and 7 km in depth. It has a total areal coverage of about 44, 54, 672 Sq. km, covering about 1/5 th of the Martian surface. The formation of the Valles Marineris would have taken place in the Noachian to Hesperian age that dates back about ~3.5 bya (Tanaka, 1986). The Valles Marineris province is divided into 11 regions (Fig. 1) of which Melas Chasma is taken for the study, Fig. 1 shows the location of Melas Chasma and the various regions of the Valles Marineris province.

Geology of the Study Area: The Melas chasma is located at the southern end of the Valles Marineris to the east of Ius Casma and west of Coprates chasma. The Melas chasma acts a bridge connecting the eastern and western flanks of the Valles Marineris province. The Chasma is about 450km in length and 350 km in width covering nearly about approx. 1,44,405 sq. km, and broadens southwards into Sinai Planum. It is slightly oblique (NW-SE) to Ius and Coprates Chasma, with the latter being slightly offset to the south. Melas Chasma is connected to the north with the parallel Candor and Ophir Chasmata. Melas Chasma displays layered deposits and provides valuable information about the geological history of the canyon system. Because of geology of this area, it was considered as a high-priority landing site for MER rovers (Weitz et al., 2003). Based on the literature studies the age of the Melas Chasma was estimated to be from Middle Hesperian (Pelkey and Jakosky, 2002). The geology of western Melas Chasma was studied from Mars Global Surveyor mission (MGS) remote sensing data (Pelkey and Jakosky, 2002), and the surficial properties were analyzed from Mars Odyssey Thermal Emission Imaging System (THEMIS) data (Pelkey et al., 2003). Both studies concluded that the Chasma has had a complex history mainly dominated primarily by aeolian processes in the recent period of time.

Results and Discussion: Morphology of the Study Area: Fluvial Channels: Fig. 4.a and 4. b shows the well defined fluvial pattern. Fig. a is the central valley floor of the Melas Chasma which indicates that there occurred an extensive flow eroding the either sides of the ride leaving a streamlined texture on the floor. The origin and the direction of flow is indefinite. Similarly Fig. 5. b. also shows the fluvial pattern indicating the primary and secondary order of streams. The flood plain around this pattern shows a rough texture due to the deposition of debris.

Dune Fields: Fig. 4. c shows a complex morphology in which the northern part of the image shows the dune fields that includes both mega longitudinal dunes and micro level dunes. These dunes may be developed due to the aeolian activity in very recent times since the surface has layered deposits over which the dunes are present. Below the dune field there occurs a fluvial channel that shows almost parallel channels of which one major stream in connected to feature that is similar to the water body which may be a paleo lake.

Landslide: Fig. 4. d shows part of the valley wall consisting of a linear ridge like feature with smooth texture indicating the presence of fine sediments. In the zoomed image, it is noticed well, that the occurrence of landslide of the sediment flow can be noted. There is also a difference in the texture of the area surrounding the landslide location.

Mineralogy of the Study Area: Mafic minerals The spectra of Pyroxene obtained from CRISM data and the CRISM spectral library plot of pyroxene is shown in Fig. 5.A. ii and 5.A. iii respectively. The presence of Mafic minerals like olivine and pyroxene indicates that surface material is of volcanic origin (Pelkey et al., 2007 & Burns, 1993).

Phyllosilicates: Serpentine show absorption features near 1300 nm due to OH overtones and near 2300 nm due to Al-
OH. The presence of Serpentine indicates the hydrothermal alteration of ultramafic rocks (Ehlmann et al., 2010). The spectra of serpentine obtained from CRISM data and the CRISM spectral library plot of serpentine is shown in Fig. 5.B). ii and 5.B). iii respectively.

**Summary:** The MRO HiRISE data were used to derive the morphological features which has shown evidences for fluvial channels, dunes, and results for landslides. The morphological features identified indicates that the fluvial activity aeolian activity had took place actively in the geologic history of mars. The MRO CRISM data Spectral parameter analysis has been used to identify minerals in the Melas chasma. The presence of mafic minerals indicates volcanic originated materials whereas the presence of phyllosilicates indicates low temperature chemical weathering and hydrothermal alteration.


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