Spectral Investigation of hydrated minerals on Arsia Mons and Ascraeus Mons using THEMIS and CRISM datasets

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Abstract:

Tharsis volcanic province dominates the western hemisphere of Mars [1]. Tharsis Montes, the most prominent feature in the Tharsis volcanic province consisting of large shield volcanoes include Arsia Mons, Pavonis Mons and Ascraeus Mons, linearly aligned in the SW-NE direction [2]. Tharsis Montes has a complex volcanic activity and hence, could provide insight into lithological and geologic evolution of the surface. In the present study, the mineralogical analysis for the Ascraeus and Arsia Mons were carried out by using datasets from Thermal Emission Imaging System (THEMIS) onboard Mars Odyssey in the TIR region [3] and CRISM (Compact Reconnaissance Imaging Spectrometer for Mars) instrument on board MRO (Mars Reconnaissance Orbiter) in VNIR region [4]. The relative band analysis and spectral analysis has been carried out using THEMIS datasets. The spectra from THEMIS datasets were matched with the spectra of minerals obtained from ASU spectral library [6]. Further, these regions were analyzed with much finer scale of the spectral and spatial resolution using CRISM datasets. The MAF and CHL browse product [5] of the CRISM have been used to identify the distribution of mafic minerals and hydrated minerals over the caldera and flank regions. The spectral analysis has been carried out for these regions of the Ascraeus and Arsia Montes using CRISM datasets. The results from the Relative band depth analysis gives the mapping of a mafic index as well as silica index from THEMIS IR datasets, which indicates that caldera is rich in mafic content. The results of spectra analysis were obtained from the THEMIS datasets, shows the presence of the olivine and pyroxene over the caldera regions. However, flanks of the Montes show the presence of hydrated minerals. The results from the CRISM datasets in the VNIR region also identified the presence of olivine and pyroxene along with the hydrated minerals like phyllosilicates in these regions from the browse products as well as from the spectral characterization. This suggest the active weathering and alteration over these regions. Though, there are many obstructing factors which hinder to get the noise-free data, more noise free datasets will help to understand the mineralogy and hence, could provide the in-depth knowledge of formation and evolution of the surface.

References:

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