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DIURNAL VARIATION ON MARS: CHARACTERIZING CHANGES IN AEROSOL CONCENTRATIONS, SURFACE TEMPERATURE, AND CO2 ABSORPTIONS – COMPARISON WITH EMIRATES MARS MISSION AND CURIOSITY ROVER

Abstract

Mars exhibits significant daily changes in its atmospheric conditions that impact various aspects of the planet's environment. This study aimed to characterize the diurnal variation of aerosol concentrations, surface temperature, and CO2 absorptions on Mars. To achieve the goal, data received from the Emirates eXploration Imager (EXI) of Emirates Mars Mission (EMM) and Miniature Thermal Emission Spectrometer (Mini-TES) from the Curiosity Rover were analyzed and evaluated using appropriate spectroscopy software. The data obtained from both the missions were of the time period of same sols. The graphs and data obtained from the software were then averaged out to find their trends. The results of the study showed that Mars experiences significant daily fluctuations in aerosol concentrations, with maximum values observed during the afternoon and minimum values in the early morning. These variations are driven by the combination of dust lifting processes and subsidence, as well as changes in the atmospheric mixing ratio. Additionally, our findings indicated that the surface temperature of Mars varies significantly over the course of a day, with the warmest temperatures observed during the afternoon and the coldest temperatures during the early morning. This variation is largely influenced by the planet's weak atmosphere, which allows for significant heat loss to space during the night. Finally, our analysis of CO2 absorptions on Mars revealed that the planet's atmosphere absorbs CO2 differently at different times of the day. The absorption rate is highest during the afternoon and decreases significantly during the night, reflecting the changes in atmospheric pressure and temperature over the course of a Martian day. This study provides new insights into the diurnal variation on Mars and highlights the importance of considering daily changes in atmospheric conditions when studying the planet's environment. Further research is necessary to fully understand the dynamics of aerosol concentrations, surface temperature, and CO2 absorptions on Mars and their impact on the planet's habitability.