Zonal correlation among dust, water ice clouds and temperature in the Marian atmosphere observed by MRO-MCS

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We studied the zonal correlation among dust opacity, water ice cloud opacity and air temperature observed by Mars Climate Sounder (MCS) onboard Mars Reconnaissance Orbiter (MRO). Since the MCS data provided from the NASA Planetary Data System are a huge number (> 1,000,000) of original vertical profiles of atmospheric physical properties measured along the MRO orbit, it was not easy to use them for analyses of the global-scale spatial/temporal structure of the Martian atmosphere. Therefore, we performed a 4D gridding on the data and adopted a visualization method proposed by Noguchi and Hayashi [2017], which utilized Grid Analysis and Display System (GrADS), to understand the planetary-scale variability of the Martian atmosphere.
Our previous analysis showed that the water ice cloud opacity around Hellas Planitia (30-60S, 50-100E) decreased during late autumn and early spring in the southern hemisphere (Ls=70-110 deg), and temperature and the dust opacity in the same region increased simultaneously: a negative correlation between dust and water ice clouds was found. We interpreted the results as the heatup which was caused by dust and the subsequent sublimation of water ice clouds. However, we have also found a positive correlation between dust and water ice clouds in a different region, which suggests that the increase of dust induced the increase of condensation nucleus and promoted the formation of water ice clouds in that area.

Keywords: Mars, dust, water ice clouds

