DUST OBSERVED BY MARS GLOBAL SURVEYOR THERMAL EMISSION SPECTROMETER OVER MARTIAN SOUTHERN SEASONAL POLAR CAP.

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Introduction: Observations of atmospheric aerosols (dust and water ice clouds) and water vapor by Thermal Emission Spectrometer (TES) aboard Mars Global Surveyor (MGS) in 1999-2006 [1] provided an important contribution to our understanding of the Martian dust and water cycles [2]. Retrievals of atmospheric aerosols were limited to daytime observations of areas not covered by the Seasonal Polar Caps (SPC) of CO_2 frost. Retrievals of atmospheric aerosol opacities over SPC from MGS TES observations are possible during the time of spring recession, but are complicated by the low thermal contrast between atmosphere and surface, significantly non-unit emissivity of the surface CO_2 at the far-infrared wavelengths observed by TES and the presence of spectral artifacts in the TES spectra [3].

We present here results of atmospheric dust opacity retrievals using TES data collected during Mars Years (MY) 24 through 26 over the southern SPC. These retrievals complement and expand the existing dataset of the TES retrievals. The new results are compared to multi-year simulations of dust evolution in the Martian atmosphere using MarsWRF General Circulation Model (GCM) [4].

Results: Figure 1–Figure 3 show examples of the atmospheric dust opacity retrievals for the early spring season of L_s=190-200° MY24-26. Seasonal evolution of the atmospheric dust can be traced from comparison of polar maps at different Ls. The interannual variability of the dust over SPC is apparent from comparison of results for different years. Retrievals in MY25 cover the expending and decaying phases on the planet-encircling dust storm that began on L_s~185°. Comparison of these results to numerical simulations of the dust evolution in the Martian atmosphere (Figure 4, [4]) enables better understanding of the surface dust lifting processes and the genesis of the Martian planet-encircling dust storms.

References: [1] Christensen P. R. et al. (2001) *JGR, 106(E10),* 23823–23871. [2] Smith M. D. (2004) *Icarus, 167(1),* 148-165. [3] Pankine A. A. (2015) *Planet. & Space Science, 109,* 64-75. [4] Newman, C. E. and Richardson, M. I. (2015) *Icarus, 257*, 47-87.

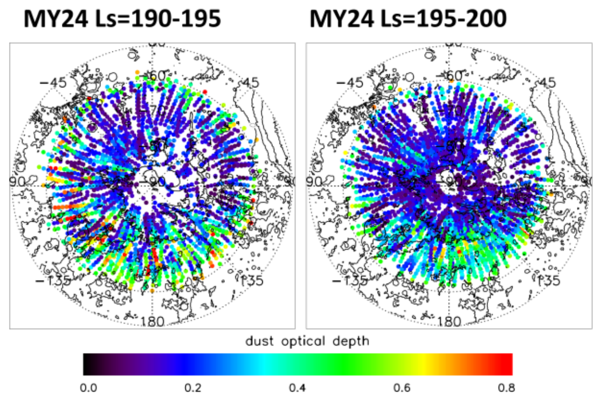

Figure 1. Polar maps of retrieved dust optical depth (at 1075 cm^{-1}) over SPC in MY24 L_s=190-200°. Black contours are MOLA topography. Maps outer edge extends to –50° latitude. 0° longitude is at the top. SPC occupies area south of –60° latitude.

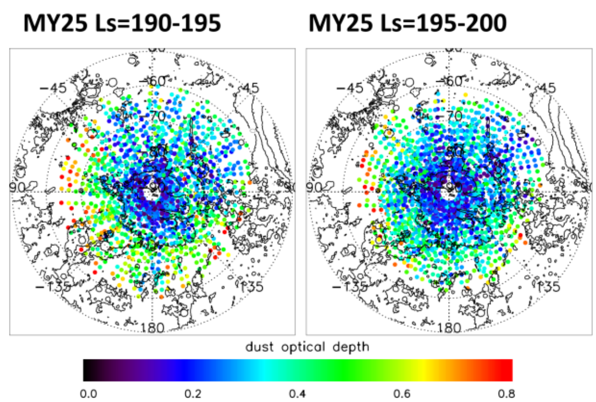

Figure 2. Same as Figure 2, but for MY25 L_s=190-200°.

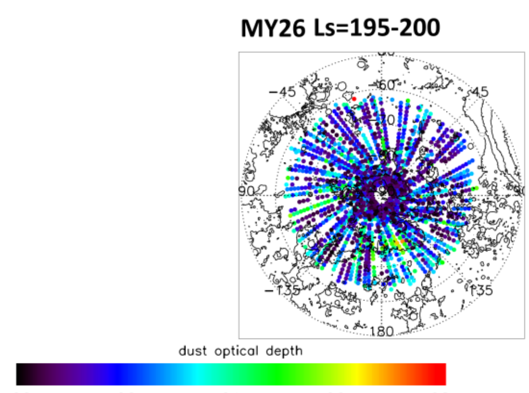

Figure 3. Same as Figure 1, but for MY26 L_s=190-200°.

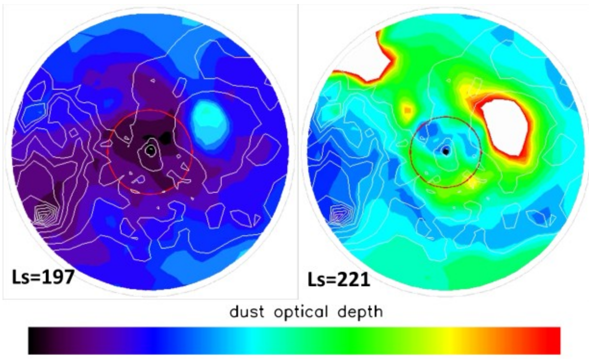

Figure 4. Atmospheric dust optical depth in the Martian Southern hemisphere at L_s=197° and 221° from WRF simulations with interactive dust lifting source. White contours show topography, red circle marks the edge of the SPC.