The Effect of the 2001 Martian Global Dust Storm on Middle Atmosphere Emissions due to the 10 μm non-LTE CO_2 Hot Bands Observed by MGS/TES

W. C. Maguire, J.C. Pearl, M.D. Smith (NASA/GSFC), B.J. Conrath (CRSR Cornell), A.A. Kutepov (NASA/GSFC and Max Planck), A.G. Feofilov (U. Munich), P.R. Christensen (Arizona State)

The orbiting Thermal Emission Spectrometer observed a planet-wide dust storm initiate at areocentric longitude L_s=185º on 26 June 2001. The dust storm developed rapidly, reaching a peak zonally averaged optical depth in the southern hemisphere at L_s~200º and decreasing slowly through L_s~220º. The atmospheric temperature at 0.5 mbar (~25 km above the surface) increased ~40º K over the corresponding L_s for the previous Martian year (1999). A comparison of the observed 10 μm CO_2 hot band emission in the middle atmosphere for L_s=200-220º shows an emission region between 80º S and 50º N for both Martian years. However, the emission region rises ~10 km (to 75 km) during the dust storm peak compared to the previous year. We present preliminary modeling of this emission region.

Calculations of the contribution of non-LTE CO_2 bands to the 15 μm LTE CO_2 bands used for temperature retrieval also have been made. Including non-LTE contributions decreases the synthetic daytime limb radiance since for 15 μm transitions the vibrational temperatures above 90-95 km are lower than the kinetic temperatures.

This work was supported in part by NASA's Mars Data Analysis Program. NAS/NRC funding was provided by NASA's RRA program.