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Martian Atmosphere Temperature at 60-100 km Retrieved from the MGS/TES Bolometer Infrared Limb Radiances

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The noise level of the TES/MGS limb-geometry spectrometer data limited retrieved temperature profiles to a maximum height of about 60-65 km. On the other hand significant signal above the noise level was still observed in the TES thermal band bolometer (5.5-100.0 mum) to at least 90-95 km. At these altitudes, the emission of the ro-vibrational bands of several CO_2 isotopes provides the main contribution to the signal. Among them there are fundamental and hot 15 μm bands and 10 μm bands. Above about 85 km during both days and nights, the breakdown of the local thermodynamic equilibrium (non-LTE) significantly affects the 15 μm radiances. During the daytime, the 10 μm emission already deviates from LTE above 40 km. We present retrievals of the kinetic temperature and pressure in the altitude range 60-100 km using the TES thermal bolometer radiances measured in the limb geometry. We employed the ALI-ARMS (for Accelerated Lambda Iterations for Atmospheric Radiation and Molecular Spectra) non-LTE model and the forward fit algorithm. This approach is based on the first principles and avoids the use of apriory climatological temperature profiles at these altitudes. The retrieved temperatures demonstrate strong wave patterns with the vertical wavelength from 15 to 20 km. Similar structures were observed during Viking, Spirit, Opportunity and Pathfinder entries. Our results support the current understanding of the tidal and planetary wave activity in the Martian middle and

upper atmosphere derived from general circulation models.