



Modeling the night-time CO₂ 4.3 μm emissions in the mesosphere/lower thermosphere

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We present a detailed non-LTE model of the night-time CO₂ 4.3 μm emissions in the MLT. The model accounts for various mechanisms of the non-thermal excitation of CO₂ molecules and both for inter- and intra-molecular vibrational-vibrational (VV) and vibrational-translational (VT) energy exchanges. In this model, we pay a specific attention to the transfer of vibrational energy of OH(ν), produced in the chemical reaction H + O₃, to the CO₂(ν_3) vibrational mode.

With the help of this model, we simulated a set of non-LTE 4.3 μm MLT limb emissions for typical atmospheric scenarios and compared the vertical profiles of integrated radiances with the corresponding SABER/TIMED observations.

The implications, which follow from this comparison, for selecting non-LTE model parameters (rate coefficients), as well as for the night-time CO₂ density retrieval in the MLT are discussed.