

MIPAS observations of ozone chemiluminescence at 5 um analysed by a new non-lte model

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The proper characterization of ozone mid-ir radiances under non-LTE conditions is very important for the retrieval of mesospheric constituents, such as ozone or carbon monoxide. A recent study of Kaufmann et al. [2006] indicated very large Envisat-MIPAS radiances at 4.8 um and suggested significant changes to standard non-LTE models of ozone to fit the measurements. To verify and extend these results, we developed a new ozone non-LTE model for the main vibrational-translational (VT) relaxation channels of ozone based on the theory of Schwartz-Slawsky-Herzfeld. The VT relaxation rates are compared with the standard approach using a Landau-Teller type scaling law. In addition to VT relaxation, we also consider vibrational-vibrational energy exchange with O₂ for various transitions and demonstrate the importance of this relaxation path for many vibrational levels. Finally, the non-LTE model parameters are constrained by comparing simulated 5um radiances with observations of the MIPAS instrument at stratospheric altitudes where the atmospheric state can be characterized from MIPAS measurements not affected by non-LTE.