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Sensitivity studies of the recent new data on O(^1D) quantum yields in O_3 Hartley band photolysis in the stratosphere

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Abstract. The production yields of excited oxygen O(^1D) atoms from the near ultraviolet O_3 photolysis are essential quantities for atmospheric chemistry calculations because of its importance as major sources of hydroxyl (OH) radicals and nitric oxide (NO). Recently, new O(^1D) quantum yields from O_3 photolysis between 230 and 305 nm in the Hartley band region were reported, which are almost independent of the photolysis wavelength (0.88-0.93) and smaller than NASA/JPL-2000 recommendations (0.95 between 240 and 300 nm). In order to assess consequences of the new data of O(^1D) quantum yields on the stratospheric chemistry, the changes in stratospheric chemical partitioning and O_3 concentration are examined using a one-dimensional atmospheric model. Our steady state model simulations for 40° N in March indicate that the smaller O(^1D) quantum yields result in increases of stratospheric O_3 (up to ~2% in the upper stratosphere), which are attributed to the changes in HO_x, NO_x, and ClO_x abundance and their catalyzed O_3 loss rates.

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