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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measurement from sun-synchronous orbit of a reaction rate controlling the diurnal NO_x cycle in the stratosphere" *by* J. C. Walker and A. Dudhia

Anonymous Referee #1

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This paper is devoted to the use of satellite measurements of O3, NO2 and N2O5 for checking stratospheric nightime NOx chemistry and in particular the value of the NO2+O3 rate constant provided by the JPL recommendations. The results are interesting. The paper is well written and the methodology is elegant and sound. However the authors could be more quantitative in their analysis and extract more information from their data without much work (see comment 3). Also, the references on the stratospheric nightime NOx are a bit dated, between 15 to 20 years old. The authors are obviously not aware that more work has been done on their topic in the last 10 years (see comment 2). I would suggest to extend the analysis and place/compare the results with the findings of other similar studies. Once it is done, the paper should be

published.

1/ 'To ensure that the influence of the a priori estimate was acceptably small, retrieved values with an a priori contribution of greater than 50% were removed from the analysis.' I am no specialist. What would happen in the cases when the a priori is excellent reproducing more or less the reality and so matching the retrieved value? Would the contribution of the a priori be greater than 50 percent?

2/ Very surprisingly, the authors do not mention and discuss previous studies devoted to the same topic (full checking of the stratospheric nightime NOx chemistry and associated rate constants; estimation of the rate constant of NO2+O3 rate) using a similar methodology (satellite chemical measurements and chemistry arguments) (see Marchand et al., GRL, 2004 et 2007).

3/ The authors compare chemical observations and theoretical calculations to conclude that the JPL value for the NO2+O3 rate constant is consistent with the observations. But how consistent? They can try to be more quantitative and go one step further. They can derive the value of the rate constant that fits best (in the least-square sense) their chemical observations using minimisation techniques. They can then compare their estimate (with uncertainties represented by the standard deviations) with the JPL value and uncertainties.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 24595, 2010.