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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Chemistry of sprite discharges through ion-neutral reactions" *by* Y. Hiraki et al.

Y. Hiraki et al.

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We appreciated the reviewer's kind criticisms. We carefully read his comments and could modify our manuscript according to them.

The main point of the criticisms is concerned with the initial values of NO. The latitude of our calculation is assumed to be 36N, however, inconsistency of the sharp drop of NO typically seen around 50 km is due to the weakness of its flux from thermosphere assigned in our model. It would be not the problem caused by the chemical reaction scheme itself. So, we consider that the total amounts of production and the relaxation behaviors in the timescale of 1 hour of NOx, Ox, and HOx are still reasonable. It may be supported by the fact that the total amount of NOx and chemistry of Ox and HOx are certainly reproduced in our chemical model with updated JPL data (Iwagami et al., 1998). However, as the referee pointed, the statement that the increase of NO by a

sprite streamer amounts to 6 orders of magnitude is originated from the initial values; even though several orders of increase will be still obtained by calculating with more appropriate values. We modified this kind of statements in our manuscript, especially in Abstract and Summary sections. We believe the importance of this paper where we estimate the chemical impact of sprites on the basis of ion chemistry driven by non-thermal electron kinetics. Based on several suggestions in this review, we also recognize importance of the consistency of NO_2 enhancements, which is one of final sinks of sprites, between our estimation and recent observation results (Arnone et al., 2008; now arising by other researchers).

According to other technical comments of the referee, we tried to modify our manuscript, especially in the model and discussion sections along with figure formats.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 2311, 2008.