

Interactive comment on “Tomography-like retrieval of auroral volume emission ratios for the 31 January 2008 Hotel Payload 2 event” by C.-F. Enell et al.

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Referee 1: The manuscript describes an event study on the Hotel Payload 2 rocket launch. The ionospheric conditions before, during and after the launch have been analyzed and published in great detail in the author's previous article. The current study focusses on results of a tomography-like method, which uses auroral images to determine ionospheric emission rate ratio profiles of different auroral emissions.

The presentation is clear and well-written but lacks the aspect of substantially new. The tomography method has been used and tested in a number of earlier studies.

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The purpose of the study was primarily to compare theoretical 5577/4278 ratios to those observed, and secondly also to test the method, as auroral studies with the ALIS system have thus far been rather rare. The system and methods have mostly been applied to studies of radio-induced optical emissions (RIOE, also sometimes called artificial aurora), and meteors.

The authors compare the tomography results to an ionospheric model and to EOS Aura satellite measurements but come to “a zero conclusion”.

The main question is whether the retrieved ratios confirm the observation of unusual (i.e. not agreeing with the empirical MSIS model) O and NO profiles by the Hotel Payload 2 rocket launched from Andøya. However, the ratios agree well with both modelled (using MSIS profiles) ratios, and ratios published (e.g. Shepherd and Shepherd, 1995). Since the satellite observations indicate that subsidence of air was limited to NW of Andøya, this is a zero result as far as using the aurora for remote sensing of chemistry is concerned.

Maybe the authors' suggestion for better absolute calibration is needed in order to bring up a meaningful comparison between the tomography results and the satellite data, and to determine whether the tomography is able to resolve the chemistry properties of the lower thermosphere.

As the referee points out it would be important to improve the absolute calibration and present the volume emission in [photons m⁻³ s⁻¹]. Absolute calibration and atmospheric transmission can in fact be addressed simultaneously by taking spectra of stars. In this study, on the other hand, the geometry is a more important limitation than the calibration, as the overlapping field of view was far from optimal.

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The obtained green to blue emission ratios confirm that the method of volume emission retrieval produced reasonable results. For this reason we consider the results worth publishing in GI as a paper of more technical nature.

References

Marianna G. Shepherd and Gordon G. Shepherd. On the I(557.7 nm)/I(427.8 nm) emission rate ratio in aurora. *J. Atmos. Terr. Phys.*, 57(8):933–943, 1995.

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