



## Dayside 630.0 nm emissions due to thermally excited O(<sup>1</sup>D) in the cusp region ionosphere over Longyearbyen, Svalbard

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In this paper we investigate the 630.0 nm emissions caused by thermally excited O(<sup>1</sup>D) during extreme electron temperatures in the cusp region ionosphere and also provide their characteristics. Particle precipitation is usually the main source of optical emissions. However, recent research has acknowledged thermal excitation of O(<sup>1</sup>D) as an additional source of 630.0 nm emissions. In this study we investigate the time, altitude and conditions during which these emissions are most likely to occur. A combination of formulae from *Mantas and Carlson [1991]* and *Carlson et al. [2013]* are used to calculate the altitude discriminated and line-of-sight integrated thermally excited O(<sup>1</sup>D) 630.0 nm intensity, where electron temperature and electron density from the European Incoherent Scatter Scientific Association (EISCAT) stationary 42 m radar at Svalbard, and atomic oxygen density from the United States Naval Research Laboratory Mass Spectrometer and Incoherent Scatter Radar 2000 model (NRLMSISE-00) are used as the primary input parameters. The calculated results of 630.0 nm are then compared with observed 630.0 nm emissions from the Meridian Scanning Photometer (MSP) at Kjell Henriksen Observatory (KHO). The days used in this study were selected on the basis of high electron temperature and high electron density as well as availability of optical data. This study shows that the thermally excited O(<sup>1</sup>D) emissions mainly occurs during magnetic noon (11:00 - 13:00 MLT) at altitudes of 350-450 km when electron temperatures exceed 3000 K and electron density exceeds  $10^{11} \text{ m}^{-3}$ .

### References

- Mantas, G. P., and H. C. Carlson (1991), Reexamination of the O(<sup>3</sup>P-<sup>1</sup>D) excitation rate by thermal electron impact, *Geophys. Res. Lett.*, 18(2), 159-162.
- Carlson, H. C., K. Oksavik and J. Moen (2013), Thermally excited 630.0 nm O(<sup>1</sup>D) emission in the cusp: A frequent high-altitude transient signature, *J. Geophys. Res. Space Physics*, 118, 1-11.