

Comment on “Danish auroral science history” by P. Stauning in Hist. Geo Space Sci., 2, 1–28, 2011

T. S. Jørgensen

Egevænget 3, Gadevang, 3400 Hillerød, Denmark

Received: 25 February 2011 – Accepted: 1 July 2011 – Published: 2 August 2011

In a recent publication Peter Stauning has provided an extensive overview of Danish auroral research over the past few centuries. He presents, however, only a brief description of the very extensive research carried out after the International Geophysical Year, 1957–1958, based mainly on all-sky camera observations and measurements with the Ørsted satellite. I present here a short note on some of the non-optical auroral research carried out in Denmark in recent years.

During the IGY ground-based recordings of VLF (Very Low Frequency) electromagnetic emissions were initiated in Greenland by the Ionosphere Laboratory at the Technical University of Denmark, and it was demonstrated in the 1960s, that the emission type called auroral hiss was produced by the auroral particle precipitation (e.g. Jørgensen, 1966).

Danish space research began in 1962 with the first rocket launch from the Andøya rocket range in northern Norway. In a Norwegian-Danish project the above mentioned Ionosphere Laboratory constructed instruments for measurements of electron and ion density in the auroral ionosphere (e.g. Jespersen et al., 1968). In 1966 the Danish Space Research Institute (today the National Space Institute) was established, and it continued to carry out rocket experiments in the auroral zone. Until 1989 Danish scientists flew experiments on about 30 rockets launched from Andøya. Besides plasma density also naturally occurring VLF noise was measured (e.g. Ungstrup, 1971)

With the purpose of investigating the dayside auroral oval and the polar cap region inside the oval the Danish Meteorological Institute (DMI) established in 1971 a sounding rocket range at Sondrestrom/Kangerlussuaq, Greenland, and until 1987 a total of 33 rockets were launched. 25 scientific institutions from 7 countries have participated in the experiments.

The DMI interests were electric fields in and around the aurora and effects of auroral activity on the neutral atmosphere (e.g. Kelley et al., 1977; Mikkelsen et al., 1981). The Danish Space Research Institute studied in particular plasma waves and electrical currents (e.g. Primdahl et al., 1979).

Following a proposal in 1975 from the DMI the Chatanika incoherent scatter radar was moved from Alaska to Sondrestrom/Kangerlussuaq in Greenland, where it since 1983 has been used for investigations of the complex phenomena which occur in the high-latitude ionosphere within the area covered and surrounded by the auroral oval. DMI interests have been to observe the reversals from sunward to antisunward plasma convection in the dayside auroral oval with the purpose of investigating the interaction between the solar wind and the magnetosphere (e.g. Jørgensen et al., 1984) and to study the spatial relationships between dayside high-latitude ionospheric currents with respect to the different magnetospheric regions (e.g. Vennerstrøm et al., 1984).

Edited by: S. Silverman

References

- Jespersen, M., Kane, J. A., and Landmark, B.: Electron and positive ion density measurements during conditions of auroral absorption, *J. Atmos. Terrest. Phys.*, 30, 1955–1963, 1968.
- Jørgensen, T. S.: Morphology of VLF hiss zones and their correlation with particle precipitation events, *J. Geophys. Res.*, 73, 1367–1375, 1966.
- Jørgensen, T. S., Friis-Christensen, E., Wickwar, V. B., Kelly, J. D., Clauer, C. R., and Banks, P. M.: On the reversal from “sunward” to “antisunward” plasma convection in the dayside high latitude ionosphere, *Geophys. Res. Lett.*, 11, 887–890, 1984.
- Kelley, M. C., Jørgensen, T. S., and Mikkelsen, I. S.: Thermospheric wind measurements in the polar region, *J. Atmos. Terrest. Phys.*, 39, 211–219, 1977.



Correspondence to: T. S. Jørgensen
(torben.s.j@mail.dk)

- Mikkelsen, I. S. and Larsen, M. F.: A numerical modelling study of the interaction between the tides and the circulation forced by the high-latitude plasma convection, *J. Geophys. Res.*, 96, 1203–1213, 1991.
- Primdahl, F., Walker, J. K., Spanglev, F., Olesen, J. K., Fahlson, U., and Ungstrup, E.: Sunlit cleft and polar cap ionospheric currents determined from rocket-borne magnetic field, plasma, and electric field observations, *J. Geophys. Res.*, 84, 6458–6470, 1979.
- Stauning, P.: Danish auroral science history, *Hist. Geo Space. Sci.*, 2, 1–28, doi:10.5194/hgss-2-1-2011, 2011.
- Ungstrup, E.: Rocket observation of VLF hiss in aurora, *Planet. Space Sci.*, 19, 1475–1495, 1971.
- Vennerstrøm, S., Friis-Christensen, E., Jørgensen, T. S., Rasmussen, O., Clauer, C. R., and Wickwar, V. B.: Ionospheric currents and F-region plasma boundaries, *Geophys. Res. Lett.*, 11, 903–906, 1984.