Tromsø Geophysical Observatory
Faculty of Science and Technology
University of Tromsø, Norway

Real-time determination and monitoring of the auroral electrojet boundaries
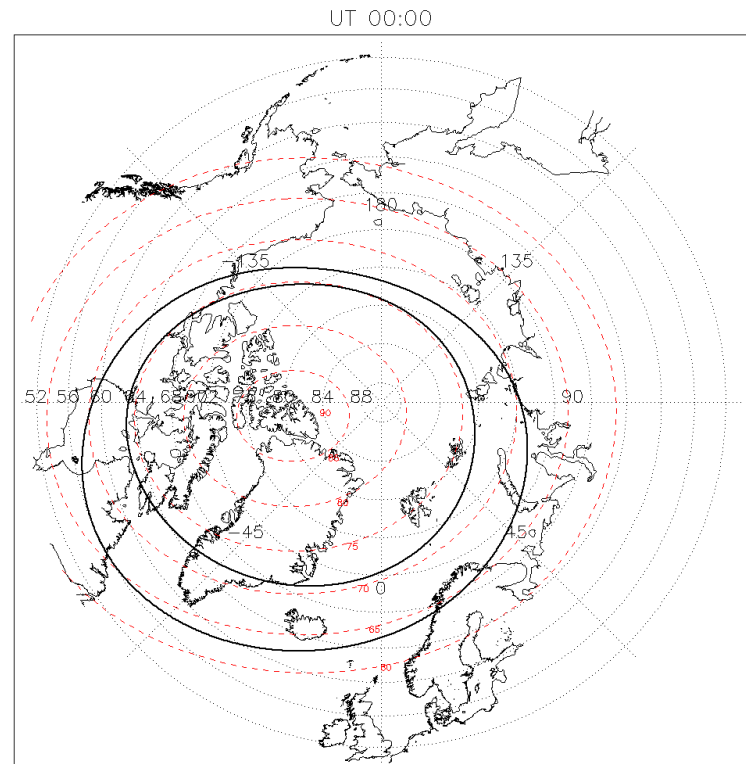
Magnar Gullikstad Johnsen

Overview

- Background
- Auroral oval and electrojets
- Method for obtaining the auroral electrojet
- Agreement between aurora and electrojet?
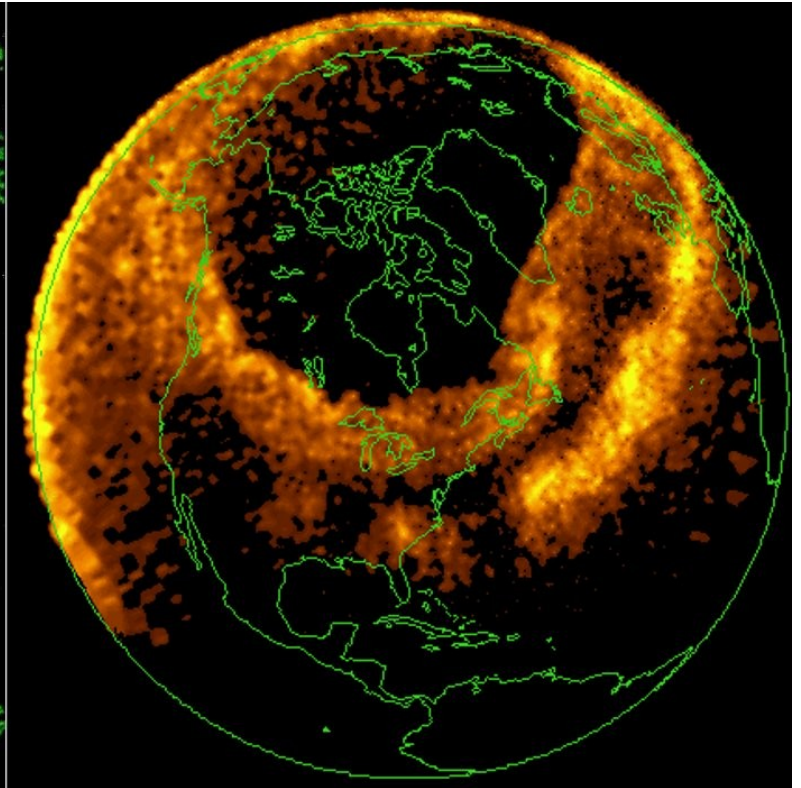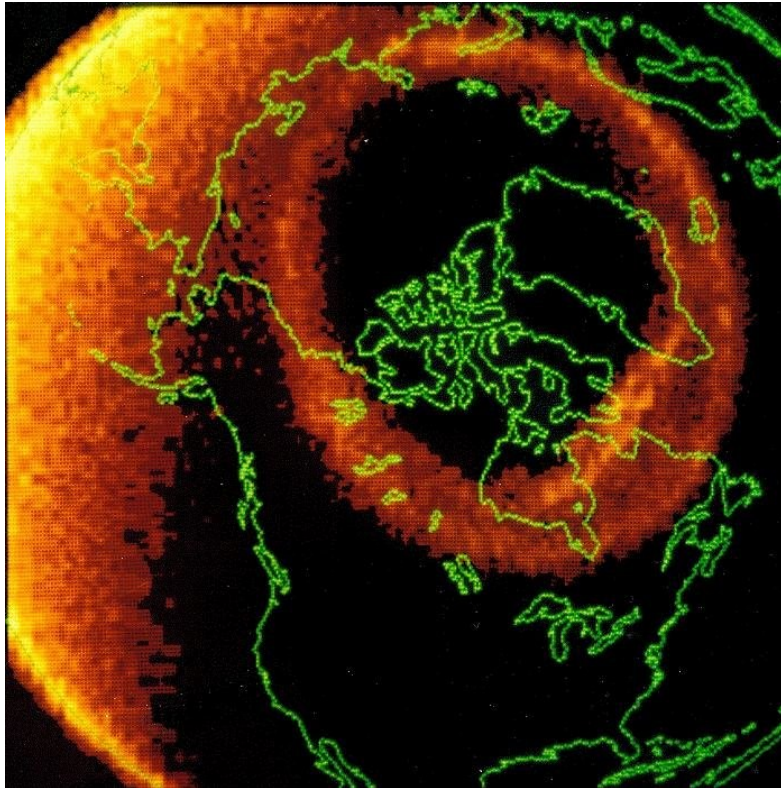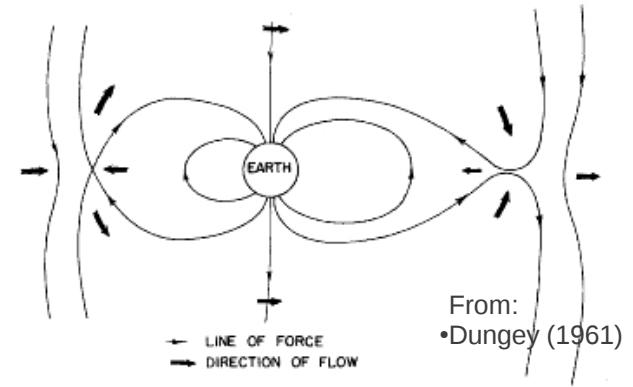- AFFECTS auroral (electrojet) tracker

Background

•Deliverable 4.3: Online provision of auroral alert and tracking system.
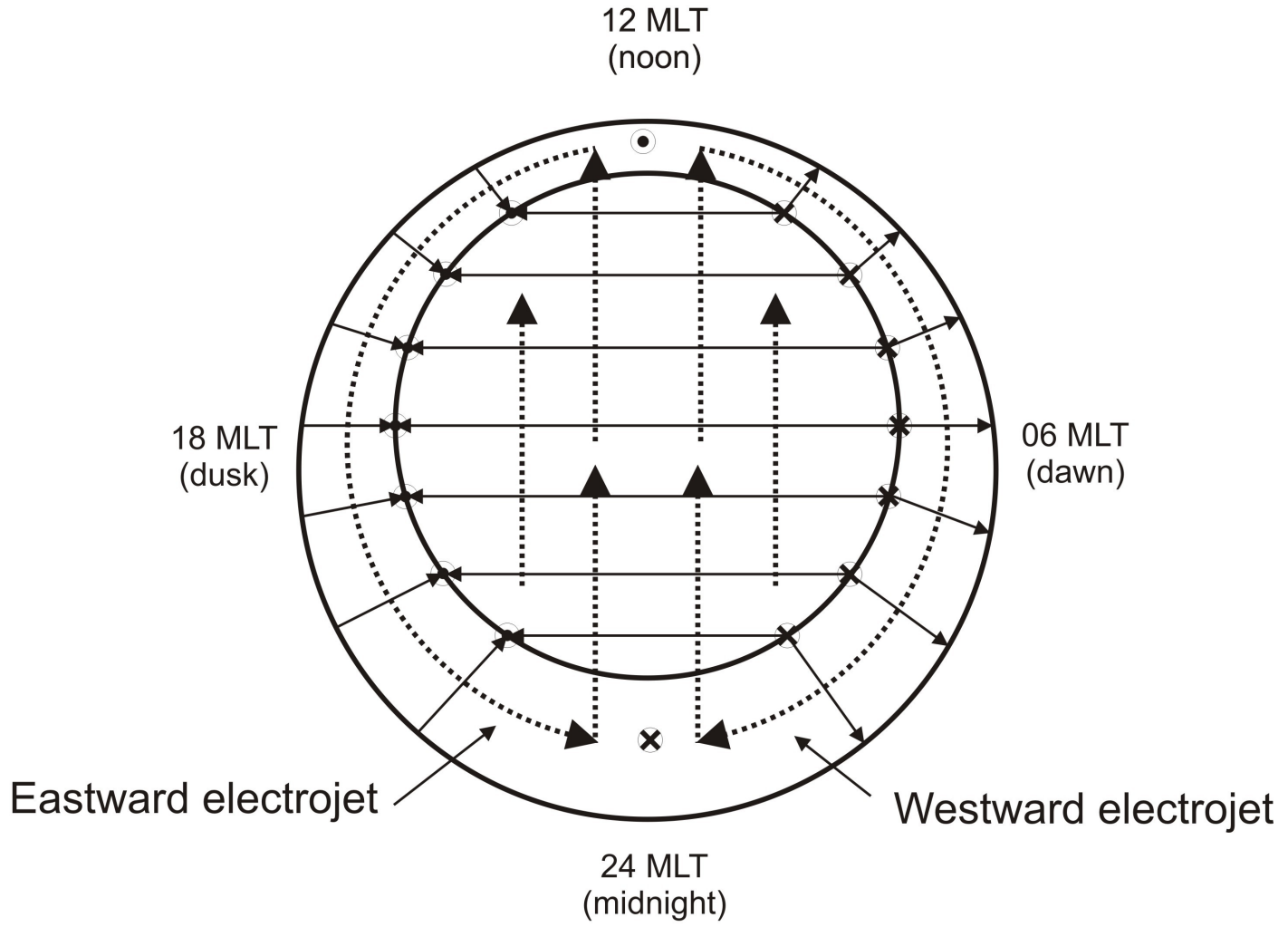
Auroral oval

From:
•Dungey (1961)

LINE OF FORCE
DIRECTION OF FLOW

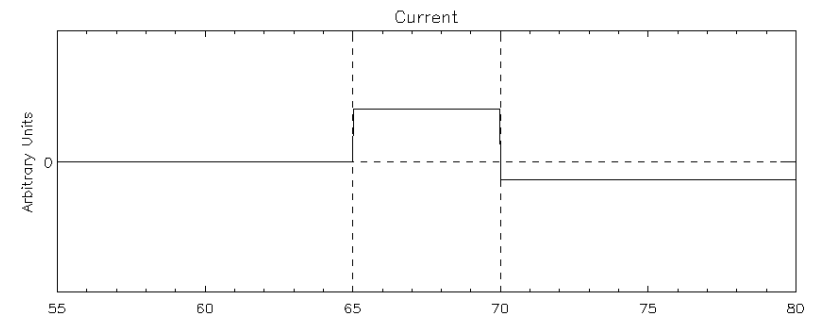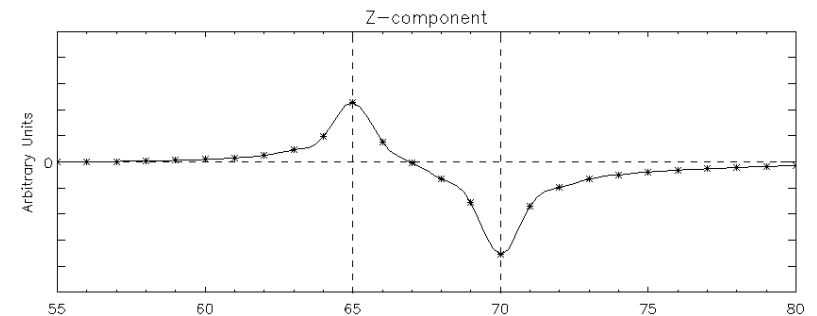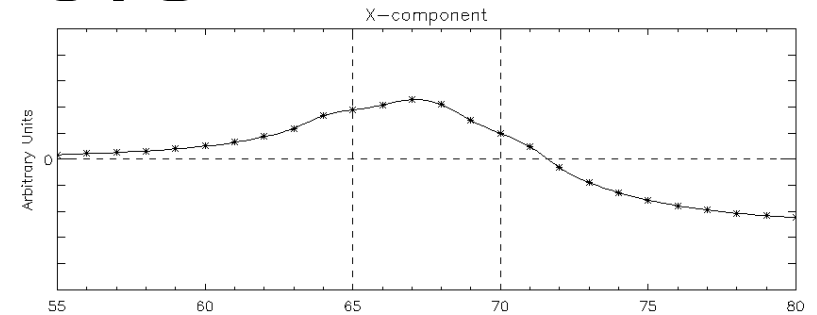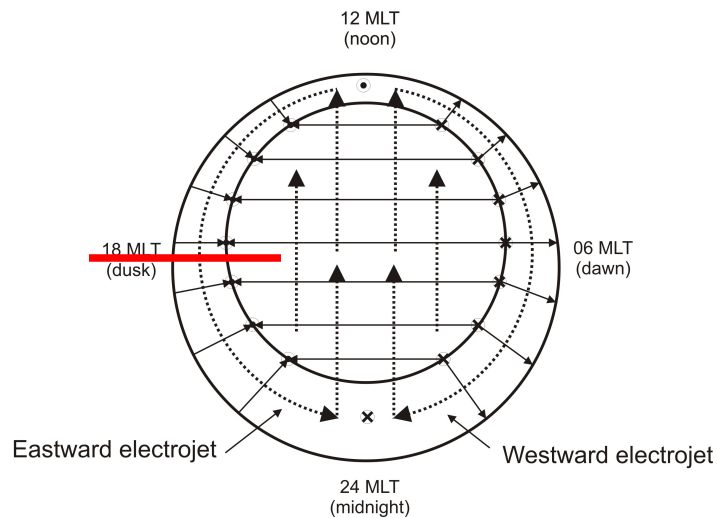Auroal oval as seen by Dynamic Explorer I (source: NASA)
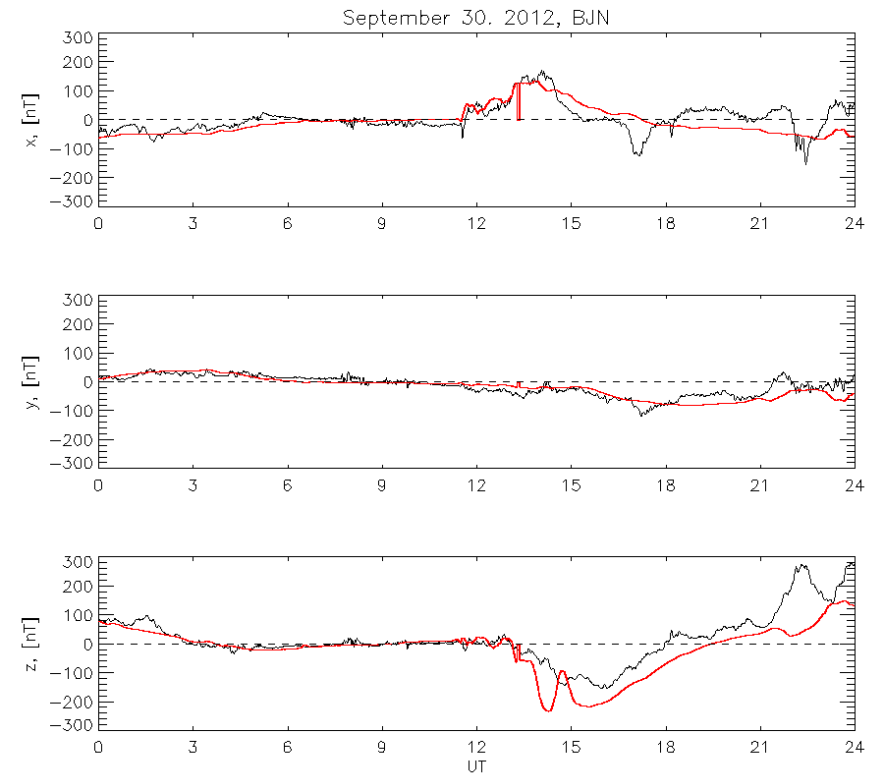
Auroral Electrojets

Method for obtaining the auroral electrojet

Method for obtaining the auroral electrojet

•Using the Weimer 2005 electric potential and FAC model, we may reproduce the geomagnetic variation at any location at high latitudes with the exception of substorms

•Thus, we can test if a chain of magnetometers may be used to locate the boundaries of the electrojet assuming it is colocated with the sunward magnetospheric convection.

September 30. 2012, BJN

# Method for obtaining the auroral electrojet
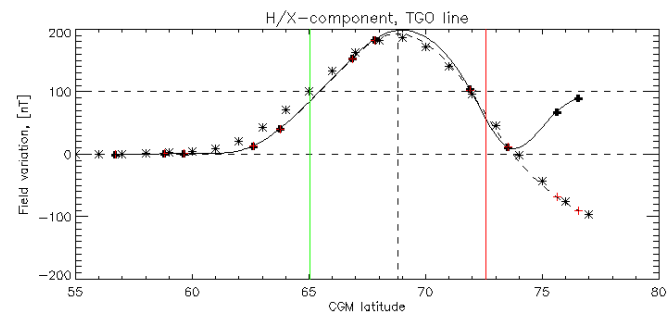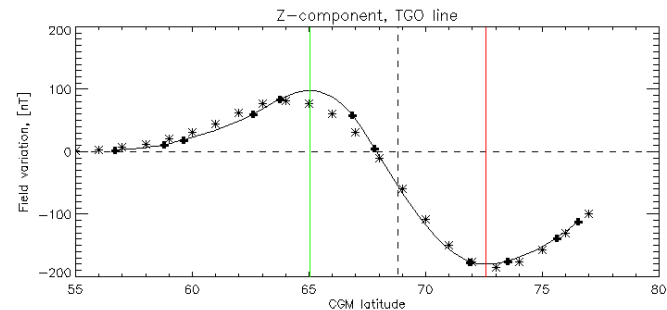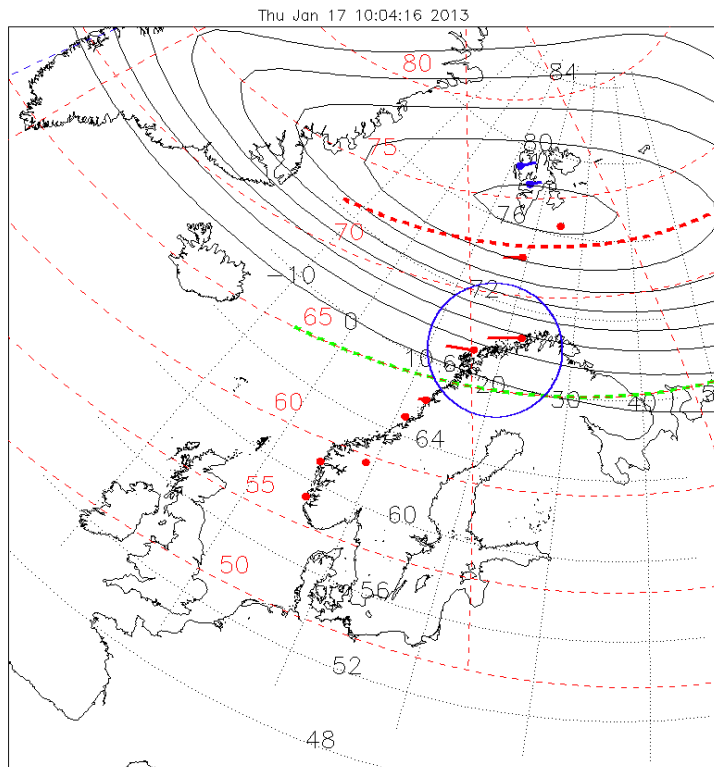
Agreement between aurora and electrojet?

- Several studies during the 1960s and 1970s (Walker (1964), Wellis et al. (1976), Winningham et al. (1979), Rostoker et al. 1979)
- General agreement in location and morphology!
- However, some systematic differences exist.
- There is room for further studies of this, especially in the dawn sector.

Agreement between aurora and electrojet?
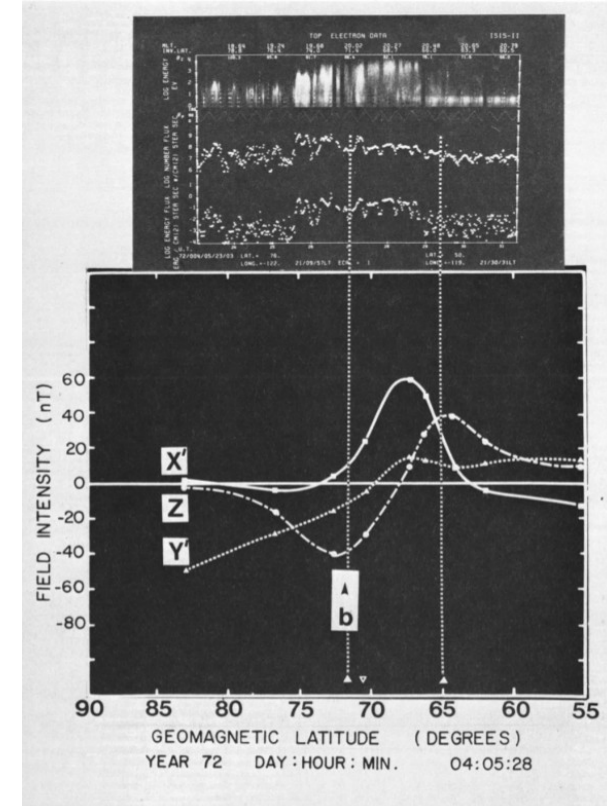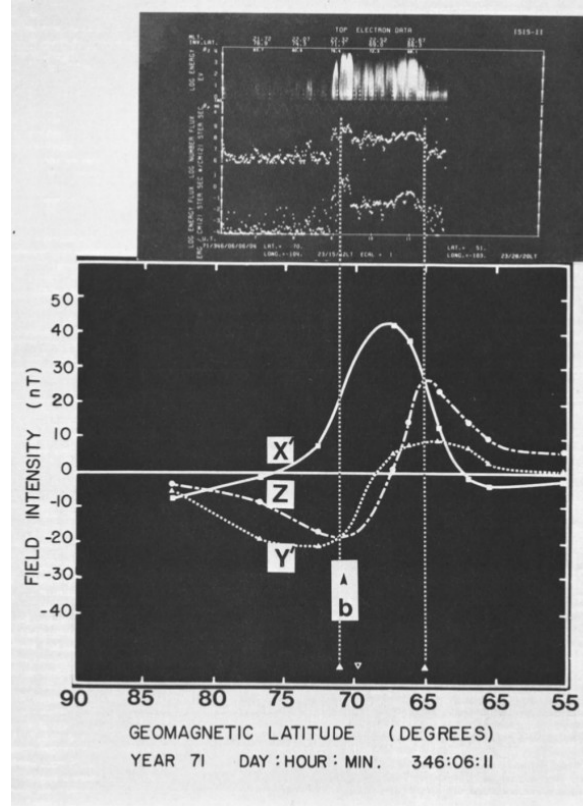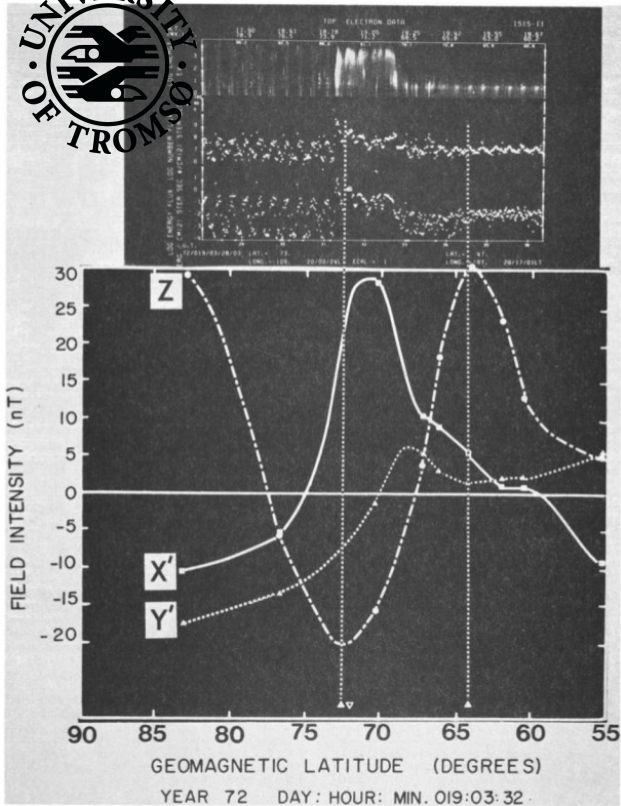
From Rostoker et al. (1979) and Winningham et al. (1979)

AFFECTS auroral (electrojet) tracker

- Method applied to near real-time data from the TGO magnetometer chain.
- Two graphical displays and one numerical part.
- The boundaries of the electrojet are determined when geomagnetic activity is higher than 75 nT
- When Europe is in Cusp and Harang discontinuity the tracker is turned off.

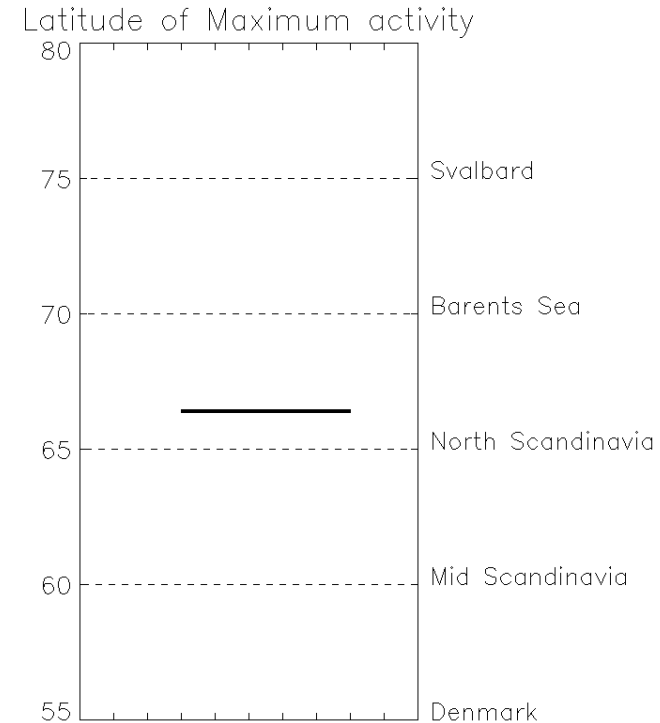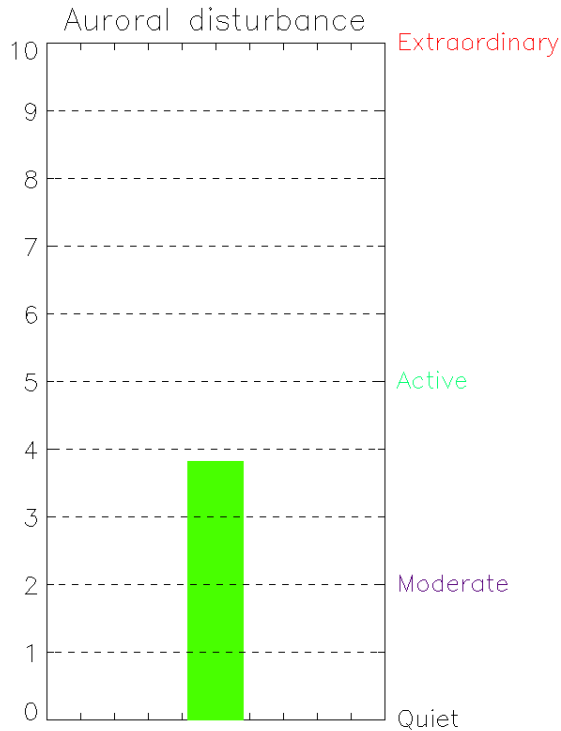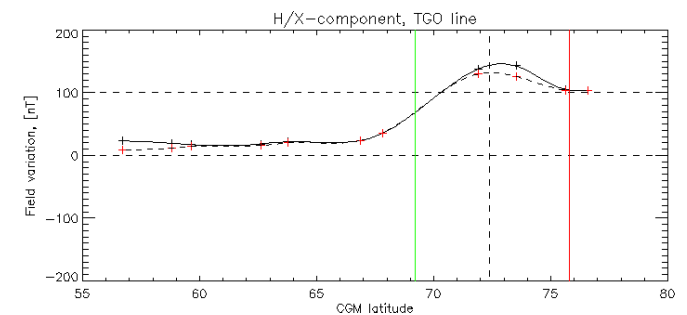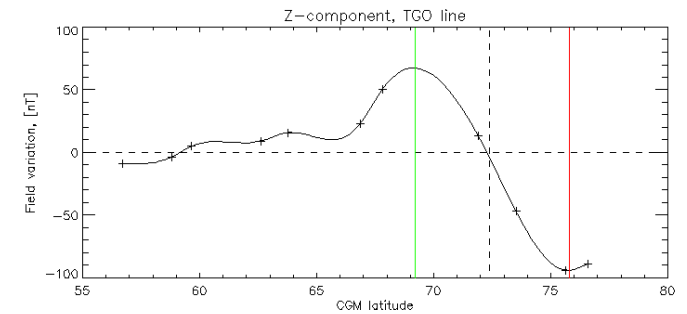# AFFECTS auroral (electrojet) tracker – Example (dawn)
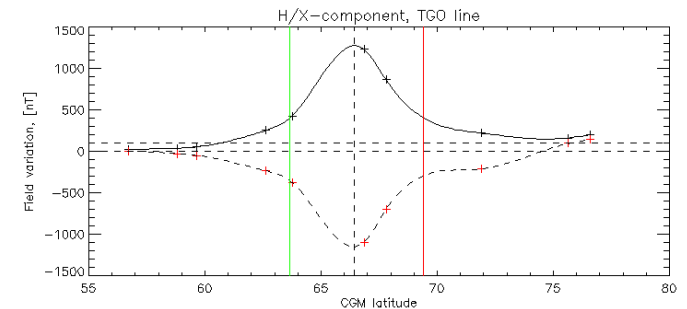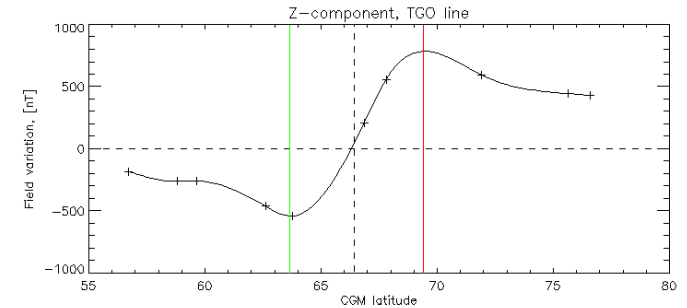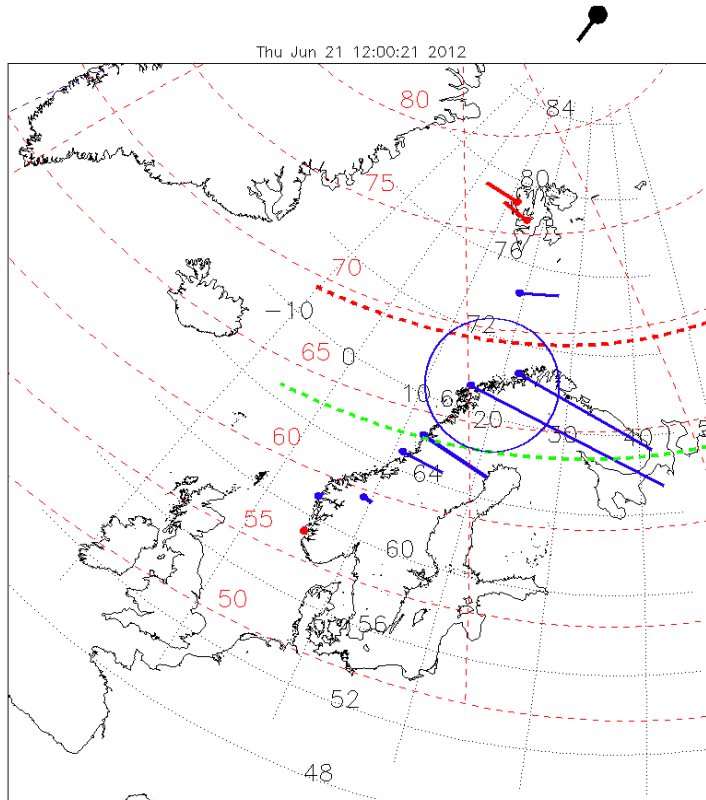
AFFECTS auroral (electrojet) tracker – Example (dawn)
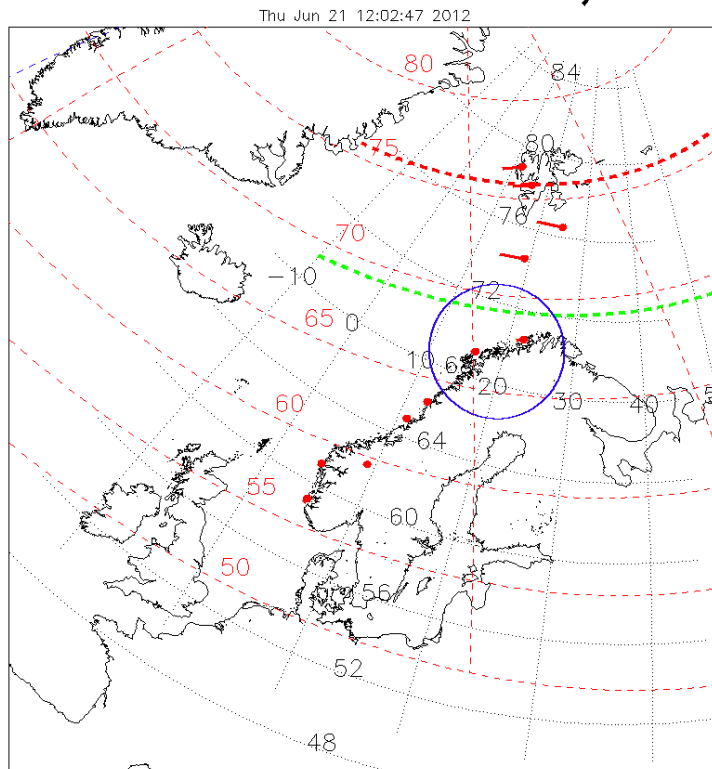
AFFECTS auroral (electrojet) tracker – Example (dusk)
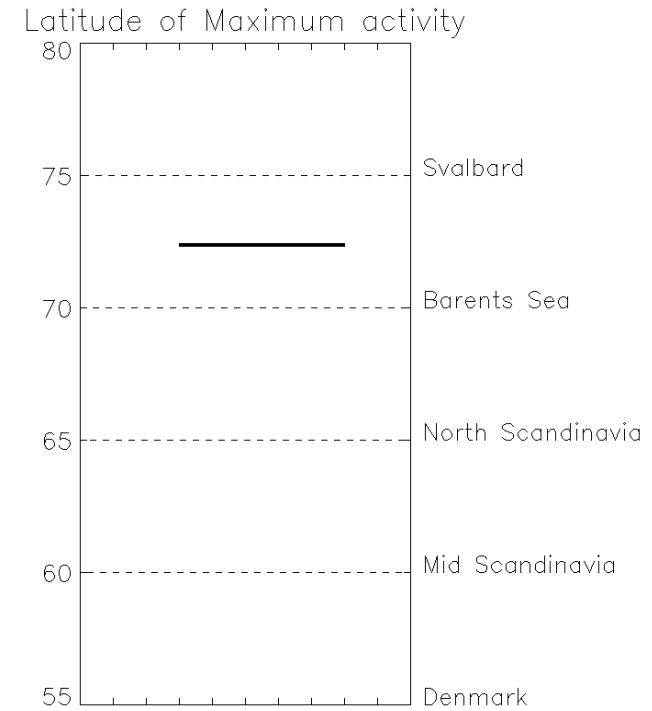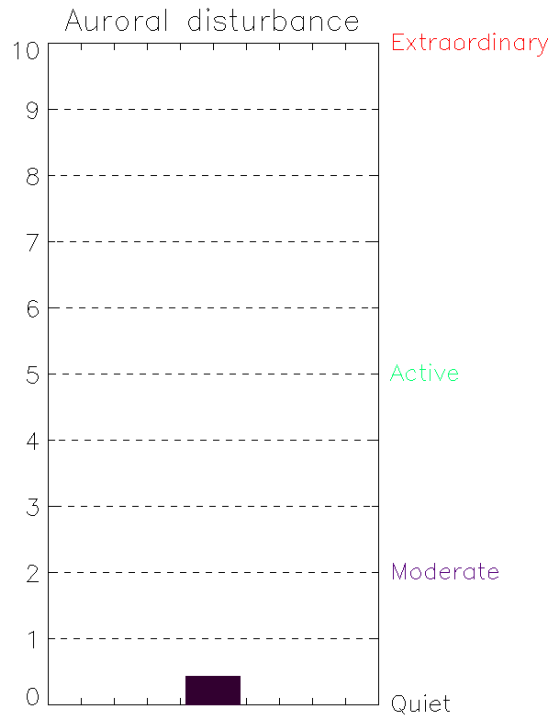
AFFECTS auroral (electrojet) tracker – Example (dusk)

AFFECTS auroral (electrojet) tracker

- Graphic displays with explanation:
http://fox.phys.uit.no/AFFECTS/

- Numerical part:
http://fox.phys.uit.no/AFFECTS/RT_oval_location.dat

AFFECTS auroral (electrojet) tracker – future possibilities

- Extend magnetometer chain southwards to be able to monitor the electrojet during severe events.
- Include more magnetometer chains for circumpolar determination
- Figure out the cusp and Harang discontinuity regions.
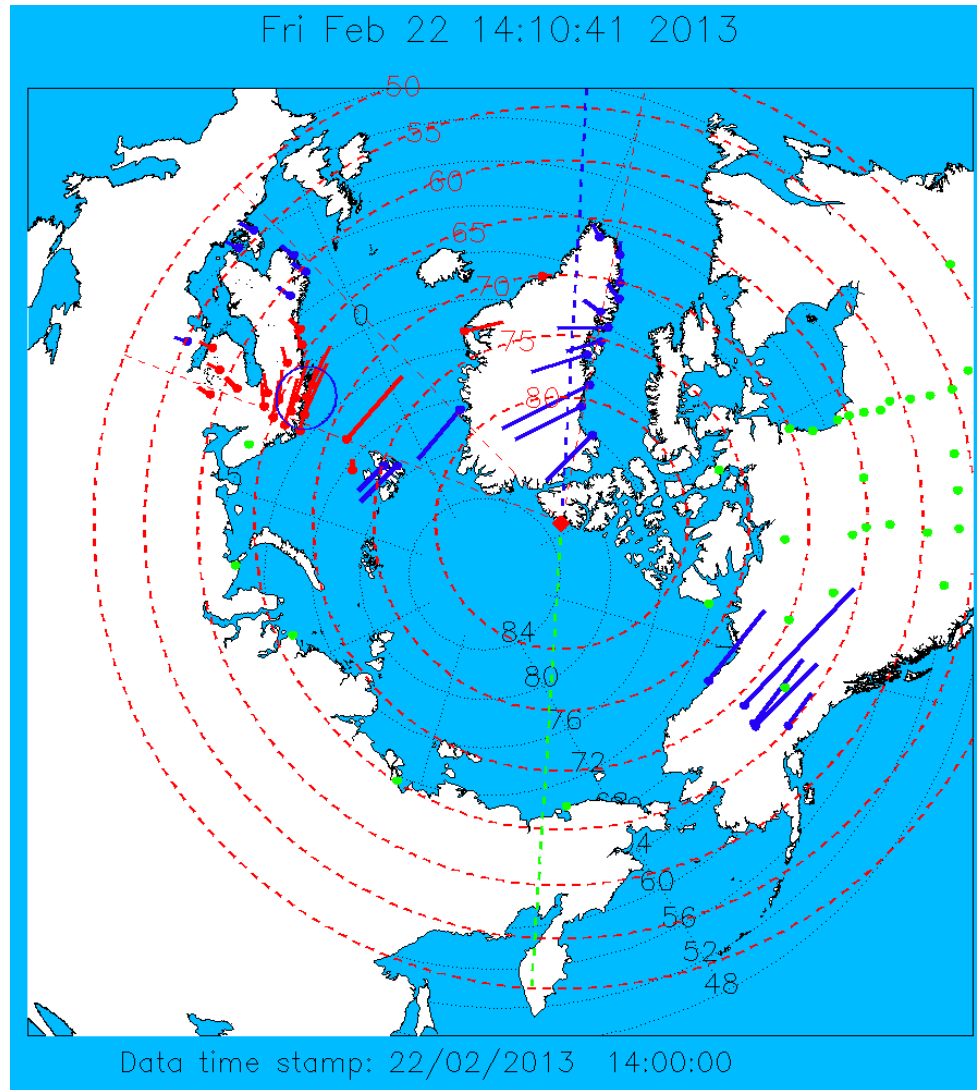- Include graphics of last 12 hour development.

AFFECTS auroral (electrojet) tracker – future possibilities
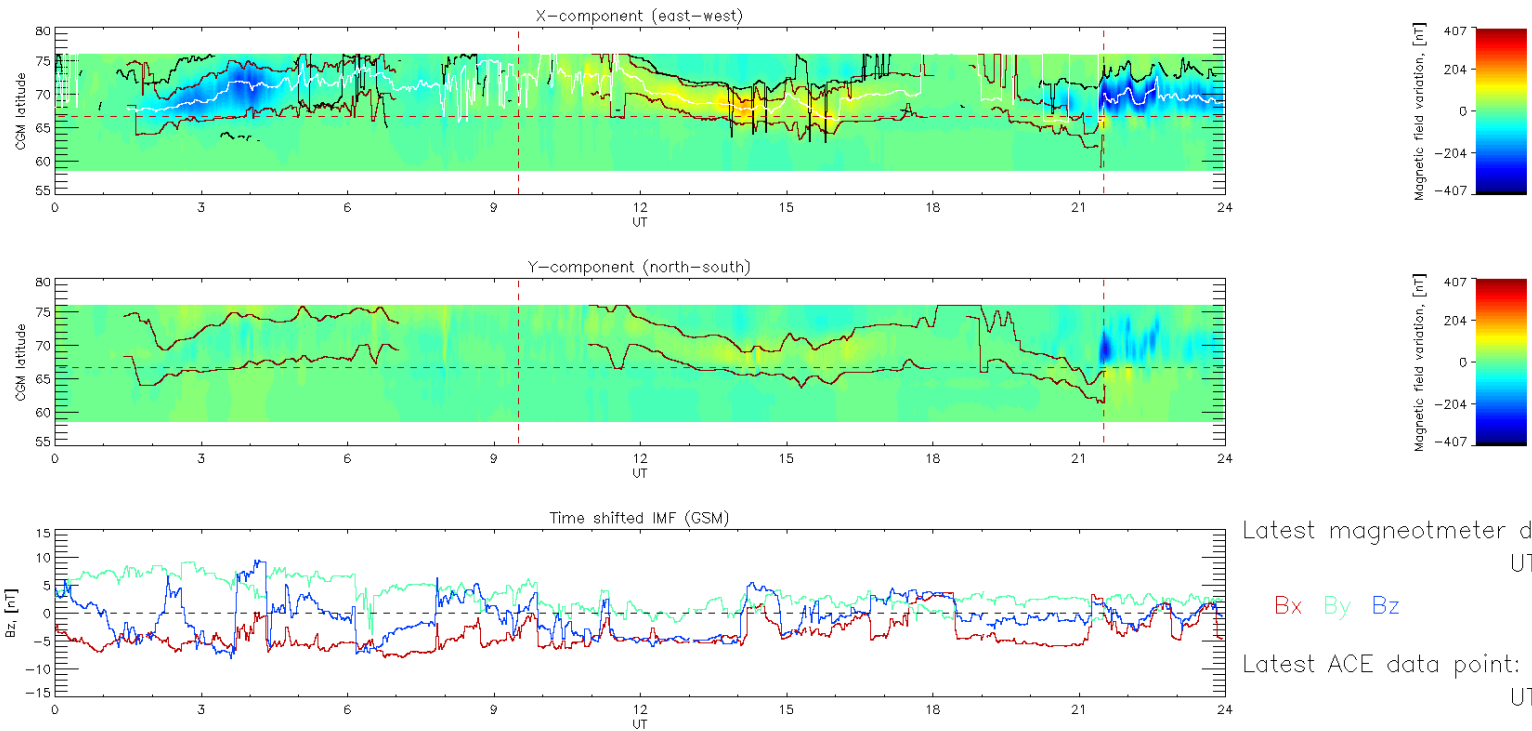
AFFECTS auroral (electrojet) tracker - future

Fri Feb 22 14:10:41 2013

Data time stamp: 22/02/2013 14:00:00

Acknowledgements

Thank you!

- Questions?
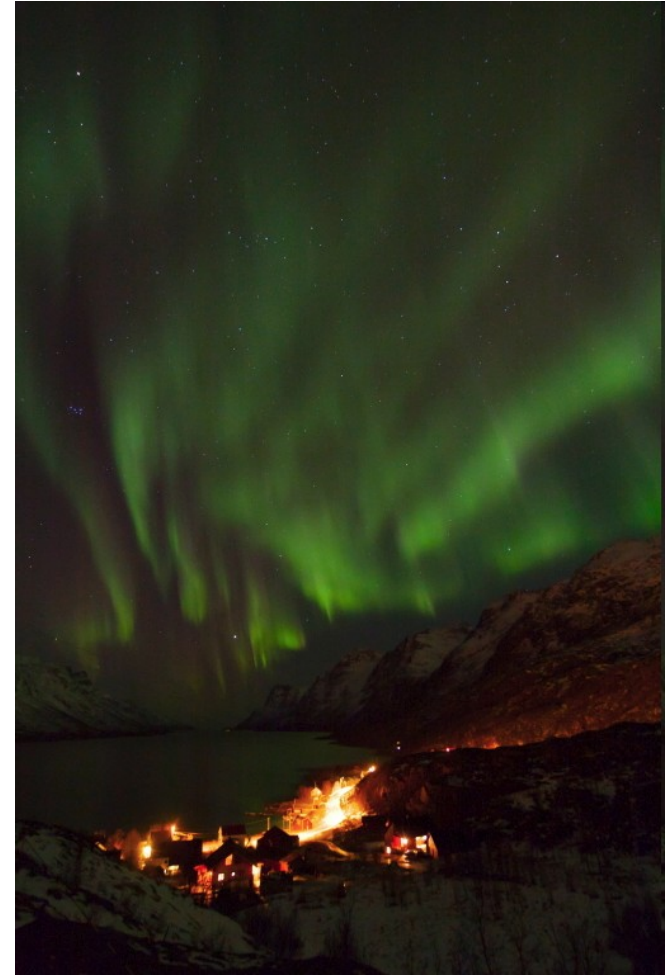
Photo: Njaal Gulbrandsen