

Norwegian report to ISWI

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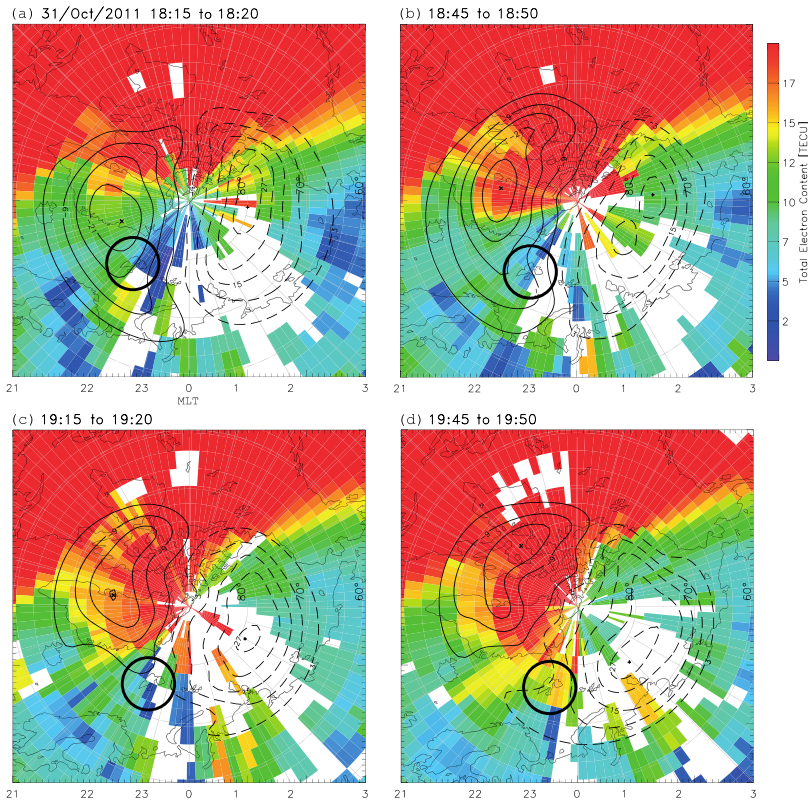
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Tromsø Geophysical Observatory (TGO)

**Birkeland Centre for Space Science - Norwegian Centre of Excellence:
2013 – 2022:**

University of Bergen (UIB)
The University Centre in Svalbard (UNIS)
Norges Tekniske Naturvitenskapelige Universitet (NTNU)



GPS signals are distorted by electron density irregularities

van Der Meeren et al, 2014:
How a tongue of ionisation affects GPS signal

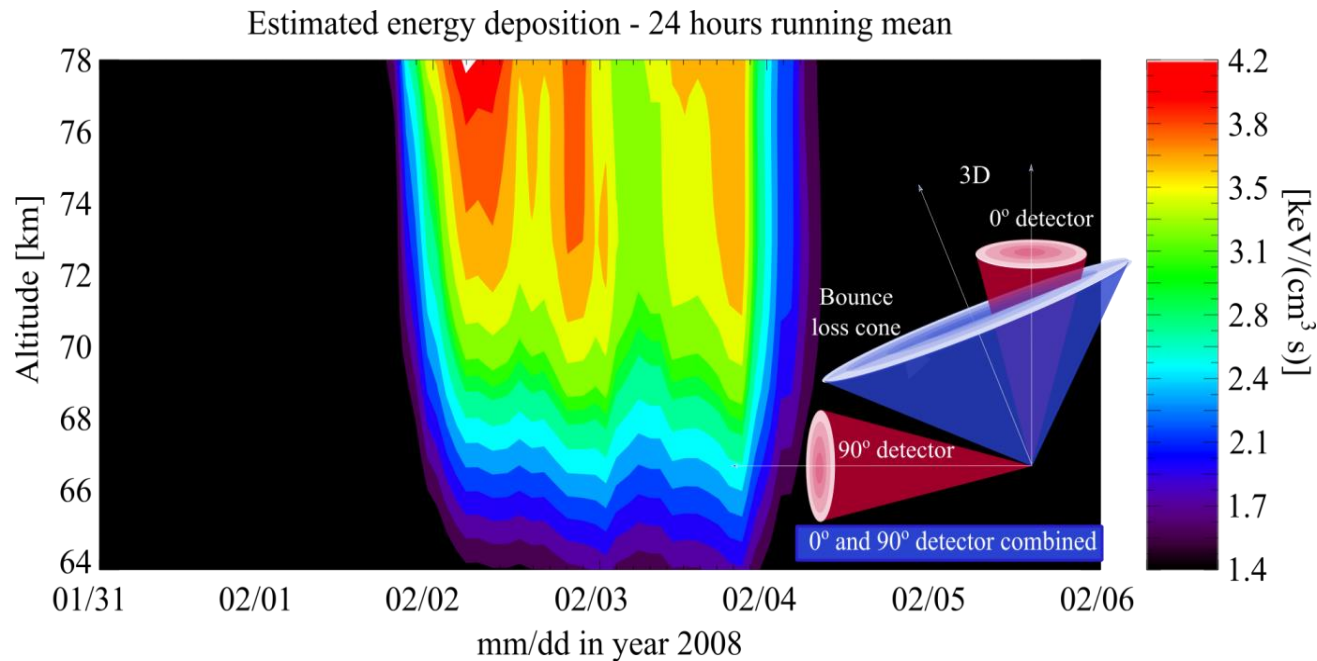
Important for Space Weather

Energetic particles affect the mesosphere:

- Temperature
- Chemistry

Nesse Tyssøy et al., 2014:

Combining two telescope + theory -> For the first time: obtain total energy input down to 65 km.





Laundal and Østgaard, 2009:

The Earth does not respond symmetrically to solar forcing

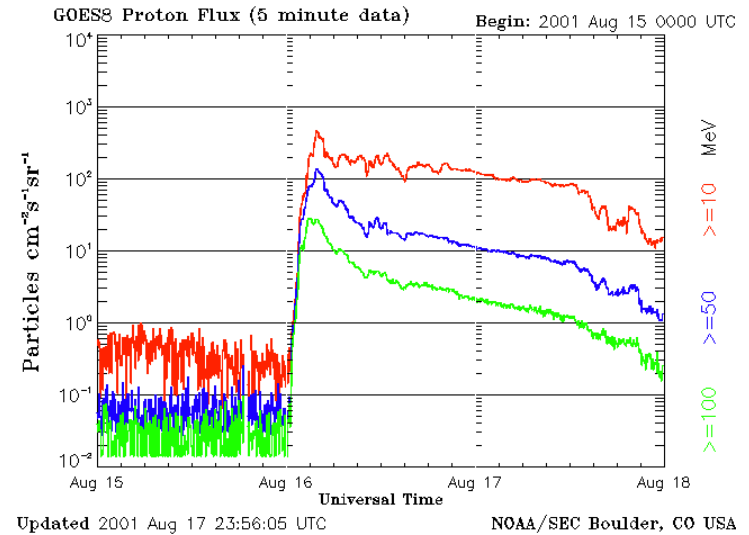
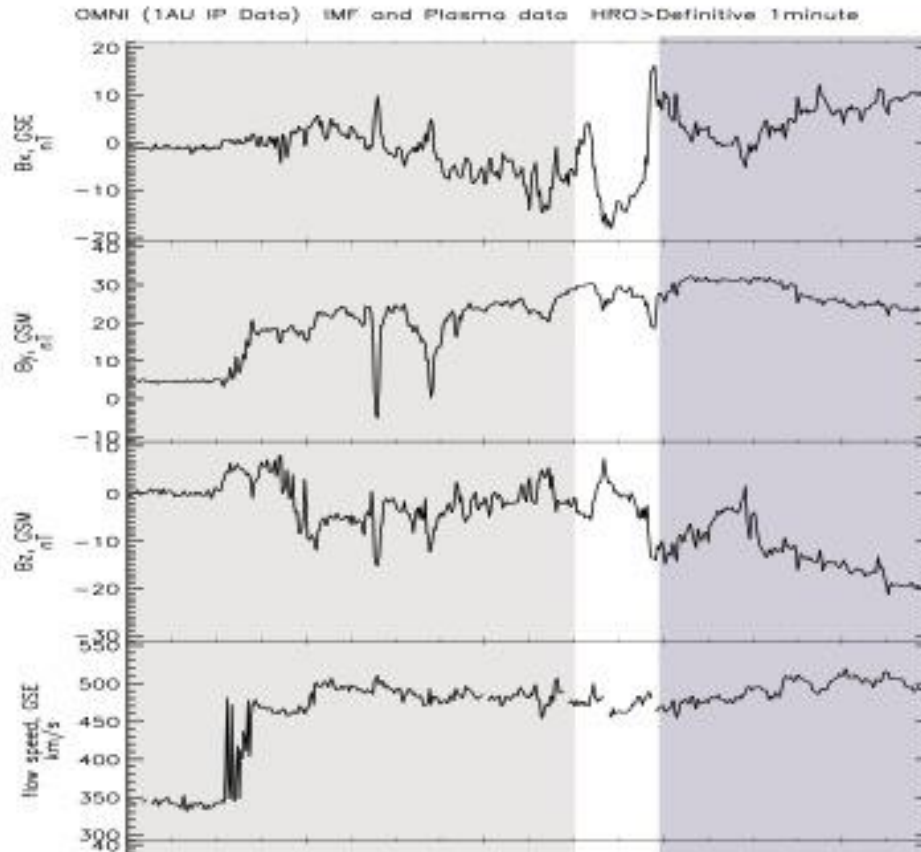
Auroras are highly asymmetric in the two hemispheres

Followed up with many papers to explain why !

CME – asymmetric geospace

CME: 16 aug 2345:05 UT

Bowshock: 35 hours later - 17 aug 1100 UT



IMF B_y : 20-30 nT

IMF B_z : -10 nT to -20 nT

4 MLT differences

