New infrastructures enable

top-tier science and upgrading of monitoring capability

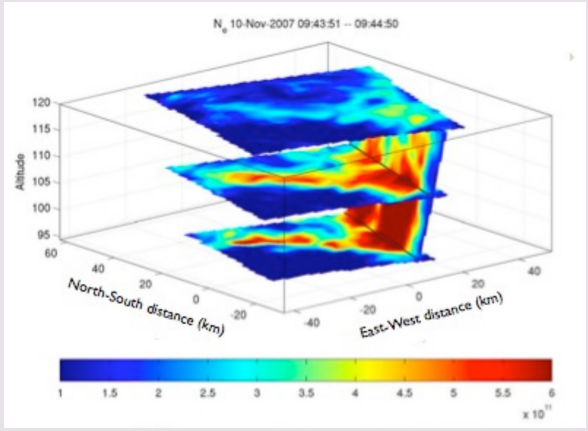
Eija Tanskanen

Sodankylä Geophysical Observatory

Large-scale infrastructures

EISCAT and EISCAT_3D

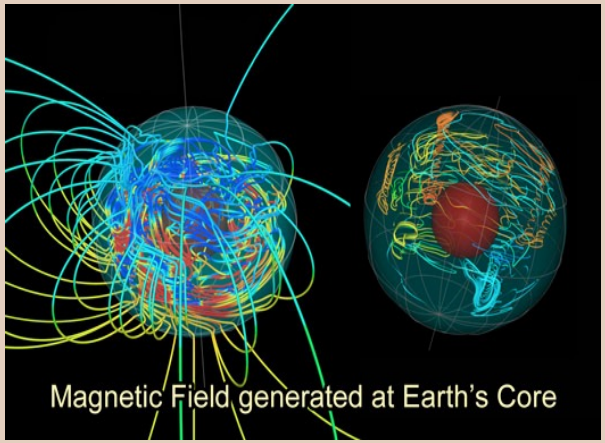
- Upper and lower atmospheric composition, spatial variability and temporal dynamics.
- New Generation Large-Scale Incoherent Scatter Radar Facility E3D enables volumetric images e.g. from E-region.

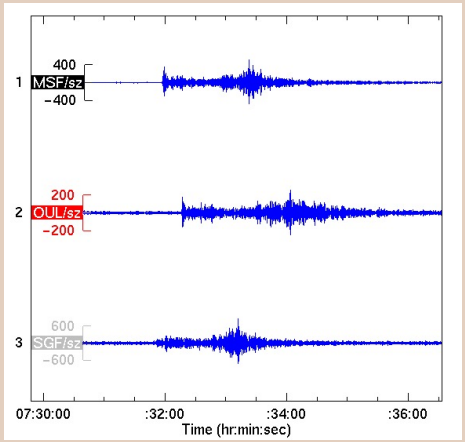


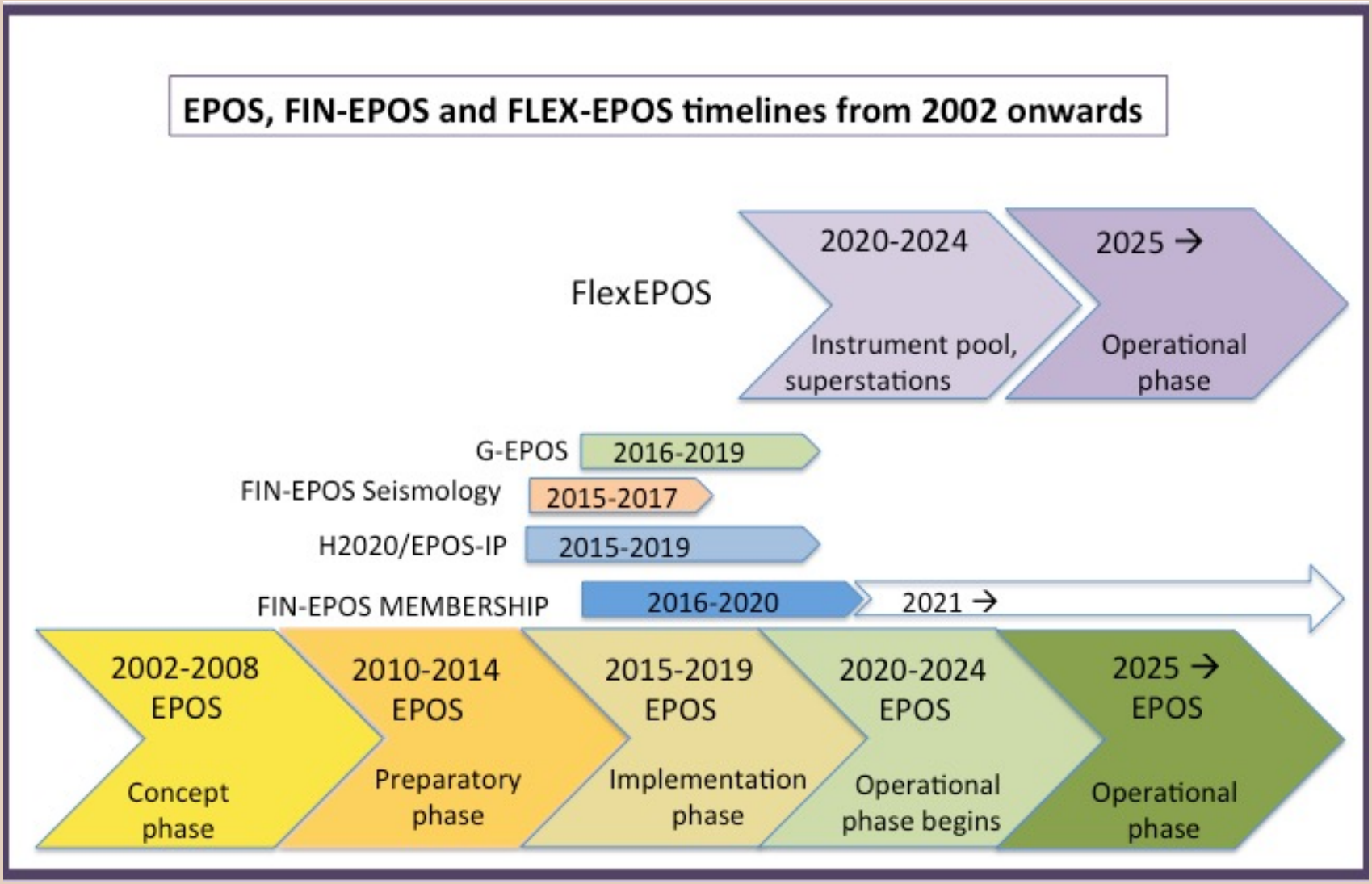
National EISCAT Co-ordination Meeting on Friday

FIN-EPOS @FIRI

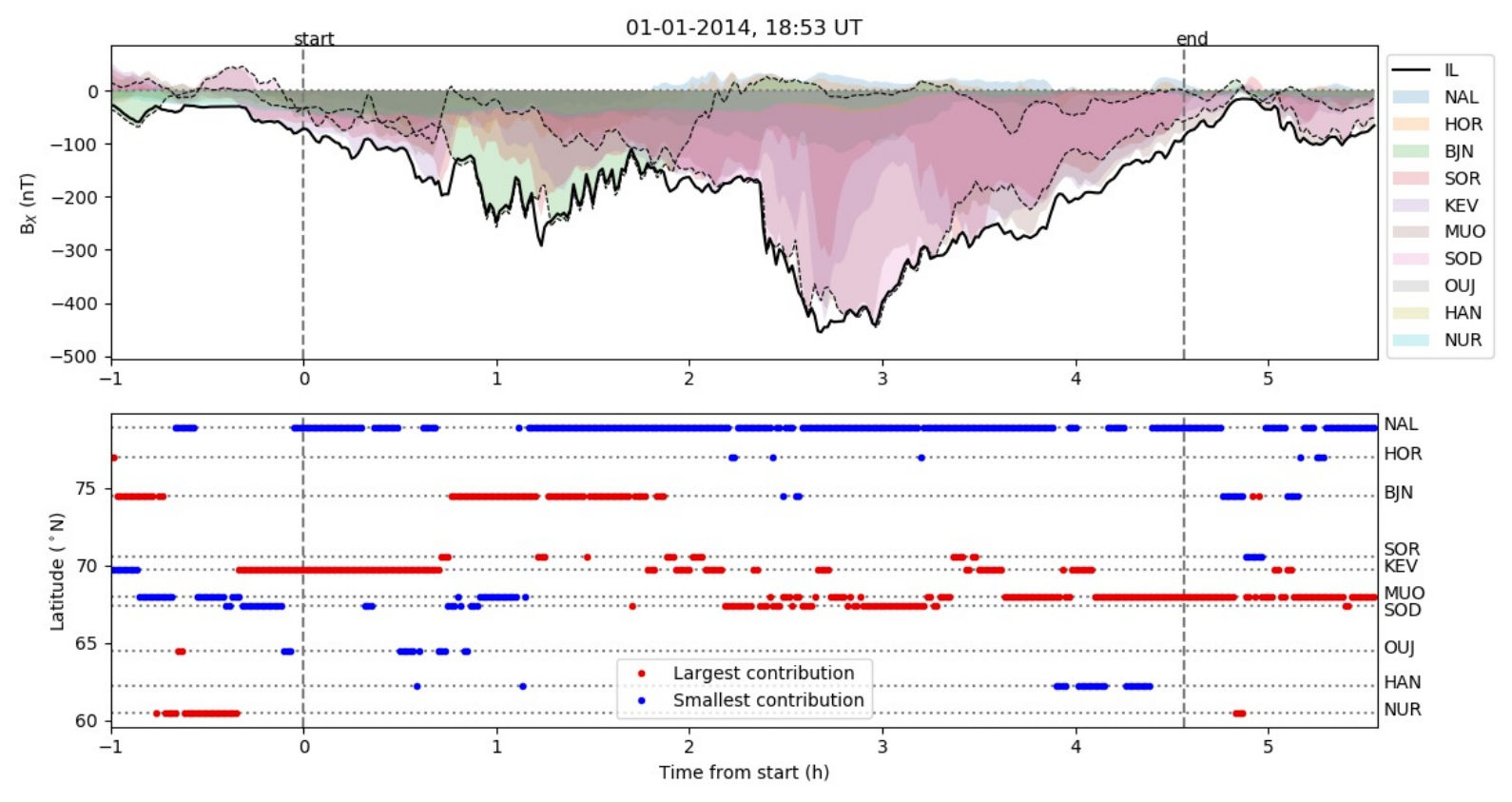
- Observatory-quality magnetic data
- Arctic seismic activity
- Long-term modulation of the Earth's magnetic field and geomagnetic activity
- Network expansion and extension

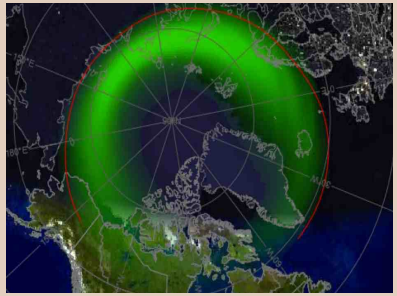





EPOS, FIN-EPOS and FLEX-EPOS timelines from 2002 onwards
FlexEPOS
2020-2024
Instrument pool, superstations
2025 →
Operational phase
G-EPOS
2016-2019
FIN-EPOS Seismology
2015-2017
H2020/EPOS-IP
2015-2019
FIN-EPOS MEMBERSHIP
2016-2020
2021 →
2002-2008 EPOS
Concept phase
2010-2014 EPOS
Preparatory phase
2015-2019 EPOS
Implementation phase
2020-2024 EPOS
Operational phase begins
2025 → EPOS
Operational phase

Substorm peak intensity latitudinal variation

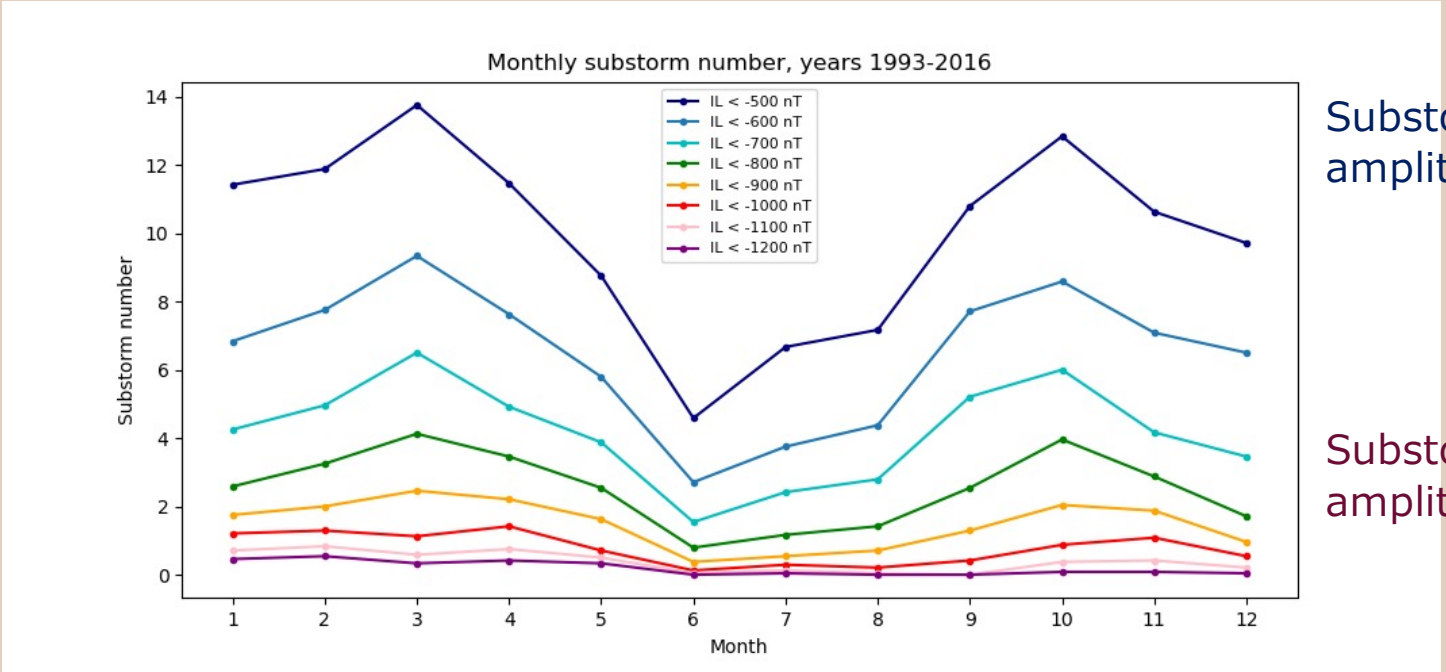




The peak amplitude during the first expansion in Bear Island and during the main expansion around Muonio & Sodankylä.

Seasonal variation of substorm number in different activity levels

Seasonal variation of substorm number less pronounced for intense substorms.

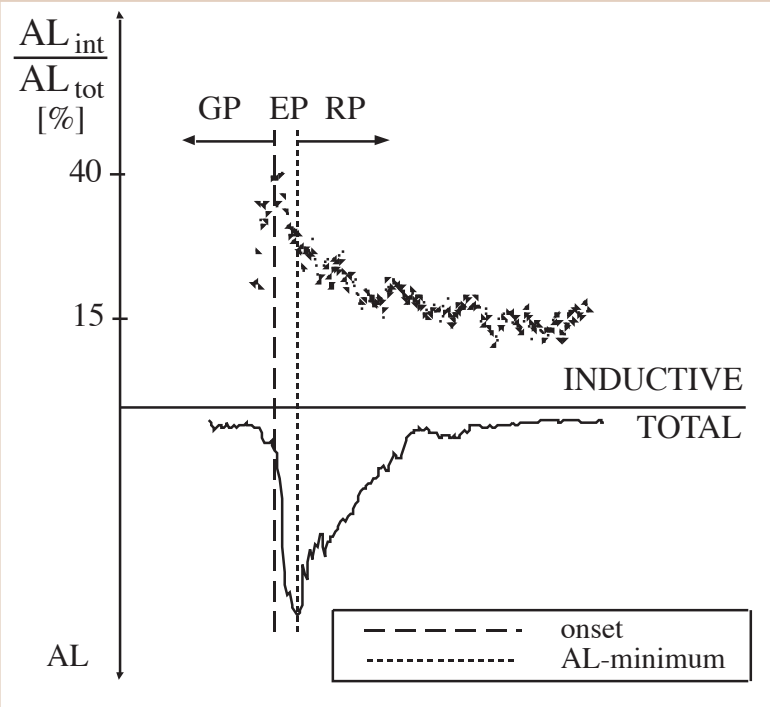


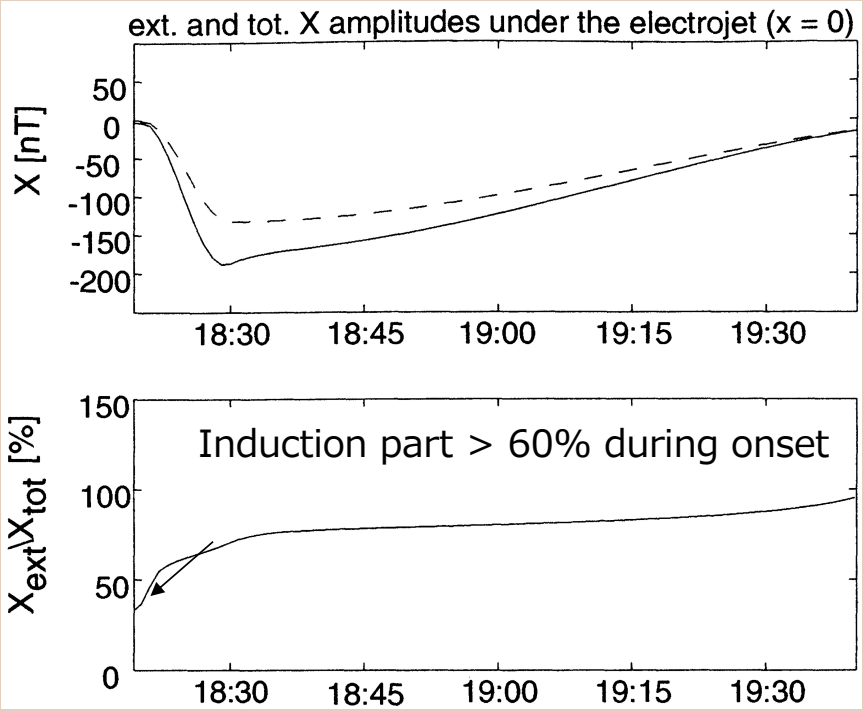
Substorms with peak amplitude < 500 nT

Substorms with peak amplitude < 1200 nT

Role of ground induction vs. external drivers

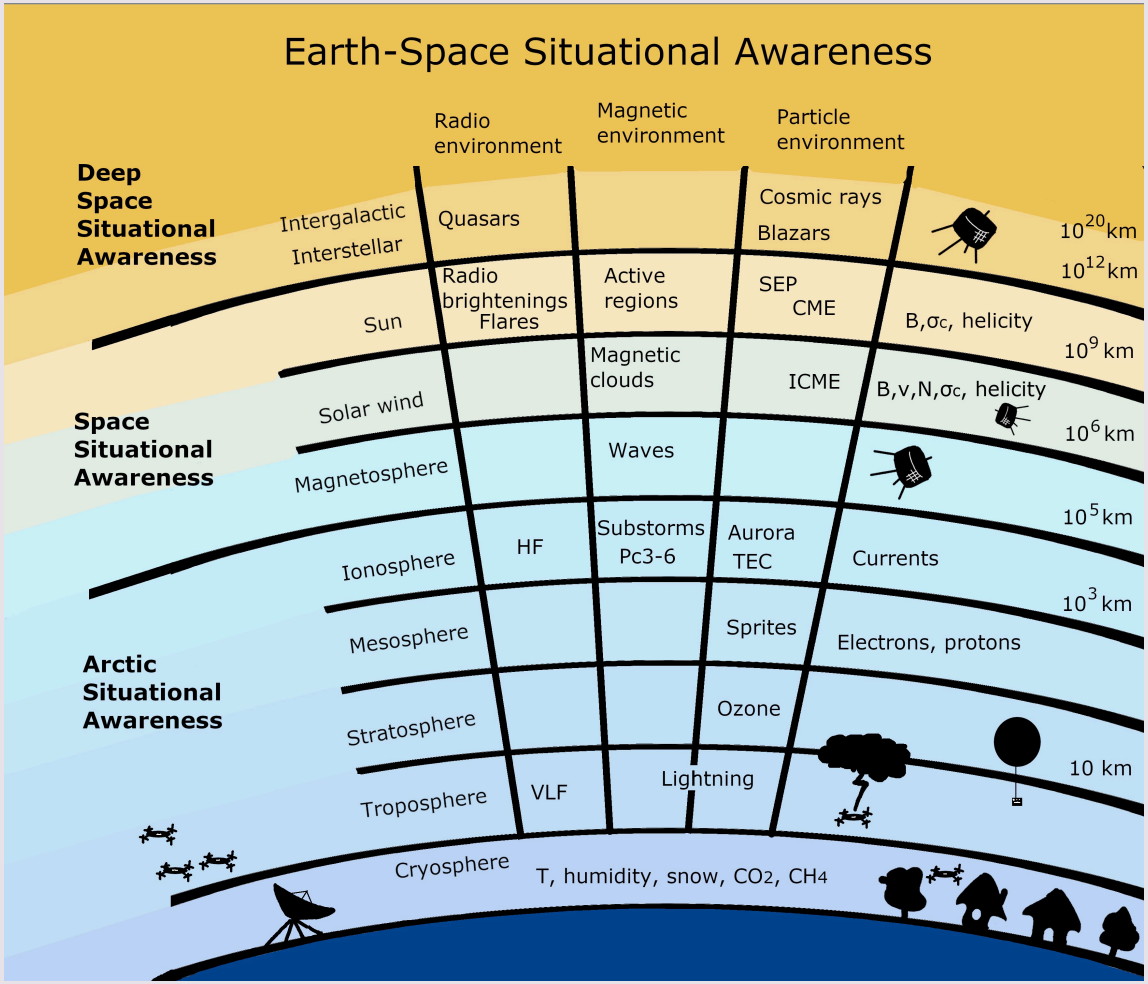
The typical internal field contribution is 40% during the rapid field variations (0.2 nT/s and 120 nT/10 min) e.g. during Pc5 pulsations or substorm onsets.





Earth-Space Research Ecosystem (E2S)

- E2S consists of observations from Tähtelä and Metsähovi megasites.
- Include continuous observatory-quality data for over 100 years.
- Target is to improve situational awareness in near and deep space environments.
- Extension and expansion of data availability from KAIRA, pulsation magnetometers, all-sky cameras and VLF sensing systems as well as drone fleet.



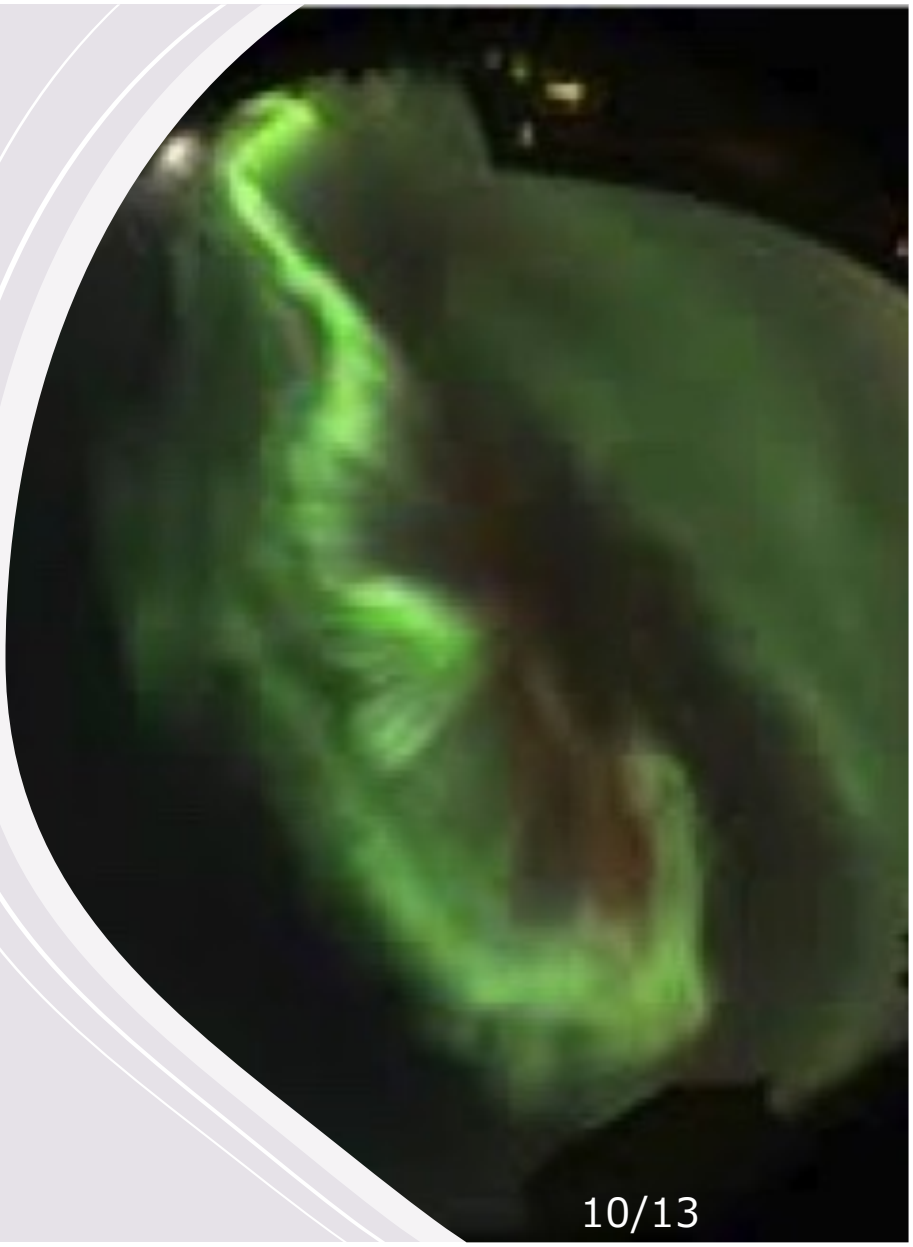
KAIRA

Kilpisjärvi Atmospheric Imaging Receiver (20-80 MHz)

- Extension of measurements for another decade.
- Software development for algorithmically detecting solar flares.
- Visualization tools for quick-look purposes.

All-sky camera network

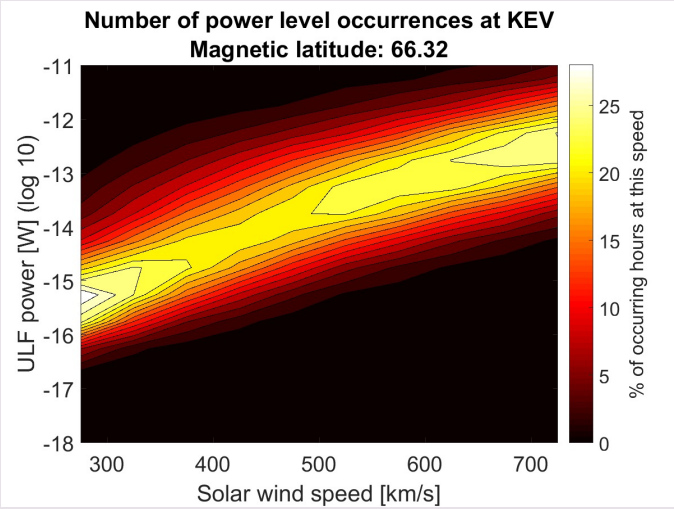
- Development of a compact autonomous all-sky camera in a collaboration with a recently launched spin-off
- Building of full-coverage network of all-sky cameras above Arctic circle
- Continuous monitoring capability (excl. summer)

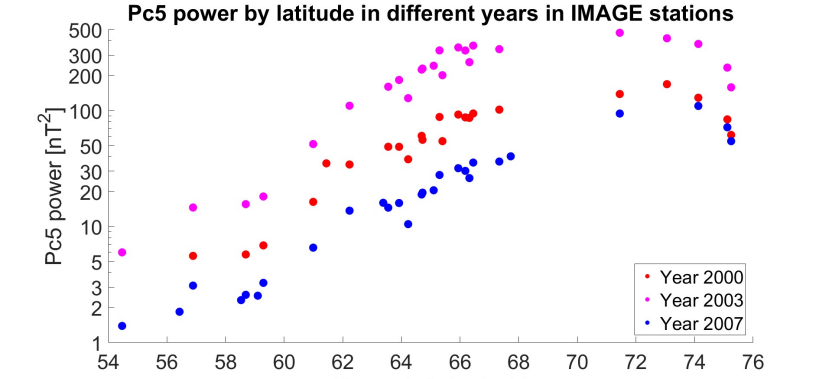


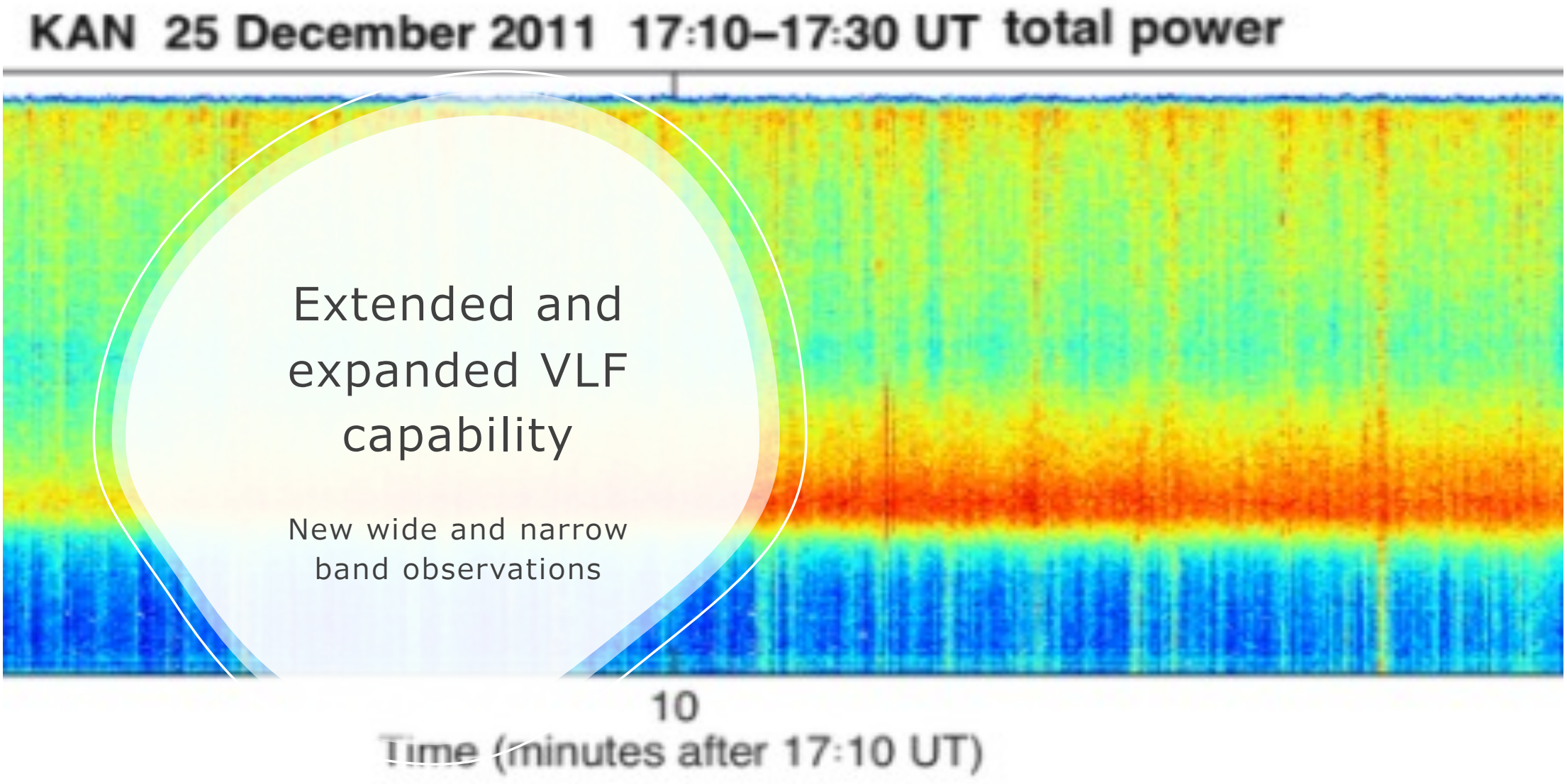
Magnetometers

incl. pulsation magnetometers

- Development of automatic data handling routines
- Algorithmical detection of Pc4-6 pulsations with wavelet or AI methods
- Visualization of pulsation activity with browser-based tools






KAN 25 December 2011 17:10–17:30 UT total power
Extended and expanded VLF capability
New wide and narrow band observations
10
Time (minutes after 17:10 UT)

Drone fleet

- New compact tracker for drones in SME collaboration.
- Improved near-surface situational awareness
- Drone fleet with different capabilities e.g. for mining, military applications, vertical sounding and education.

Thank you !