



ILMATIETEEN LAITOS  
METEOROLOGISKA INSTITUTET  
FINNISH METEOROLOGICAL INSTITUTE

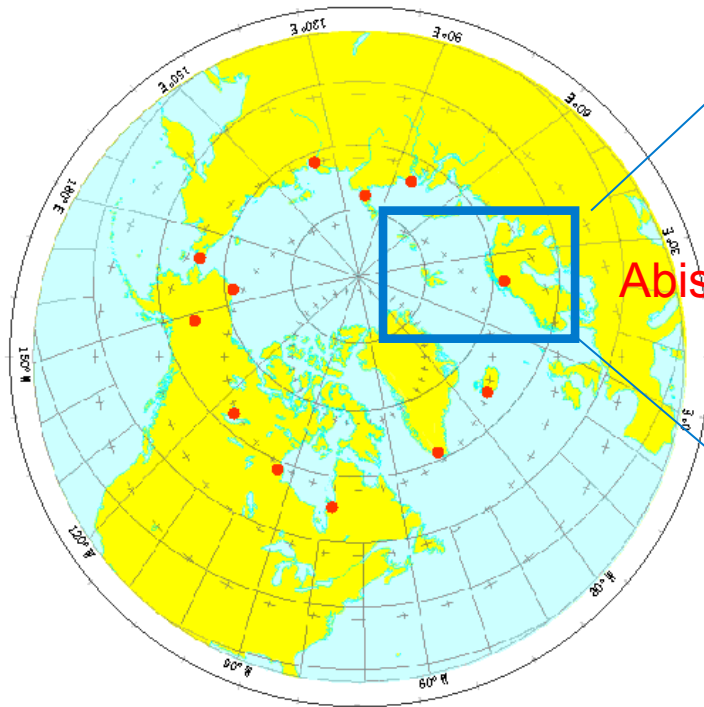
# IMAGE+ magnetometer network

Eija Tanskanen  
ReSoLVE Centre of Excellence  
Finnish Meteorological Institute

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San Francisco

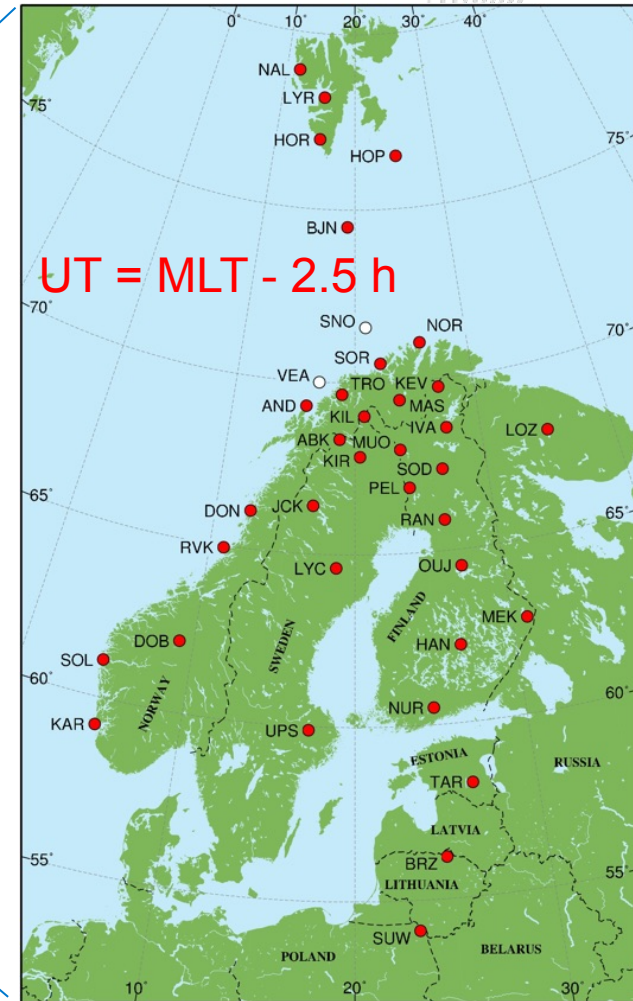


### 12 Kyoto AL observatories



Abisko (ABK)

### 35 IMAGE stations



Courtesy of Häkkinen



# IMAGE and IMAGE+ in 2015

## IMAGE magnetometers in 2015

- 33 magnetometers covering latitudes from 58 to 79 geom. latitudes.  
→ Good coverage to monitor geomagnetic activity at, above and below northern hemisphere auroral latitudes during different geomagnetic conditions.
- Level 1 data with automated calibration and error correction.  
→ Good for monitoring and near-real time applications.
- Level 2 data with manual and automated calibration and error corrections.  
→ Better data for science and services.
- Resolutions 10 and 60 s provided by most stations.  
→ Good to examine phenomena from 1 min and above i.e. hourly, daily, monthly, annual, year-to-year and solar cycle variations.

## IMAGE+ magnetometers in 2015

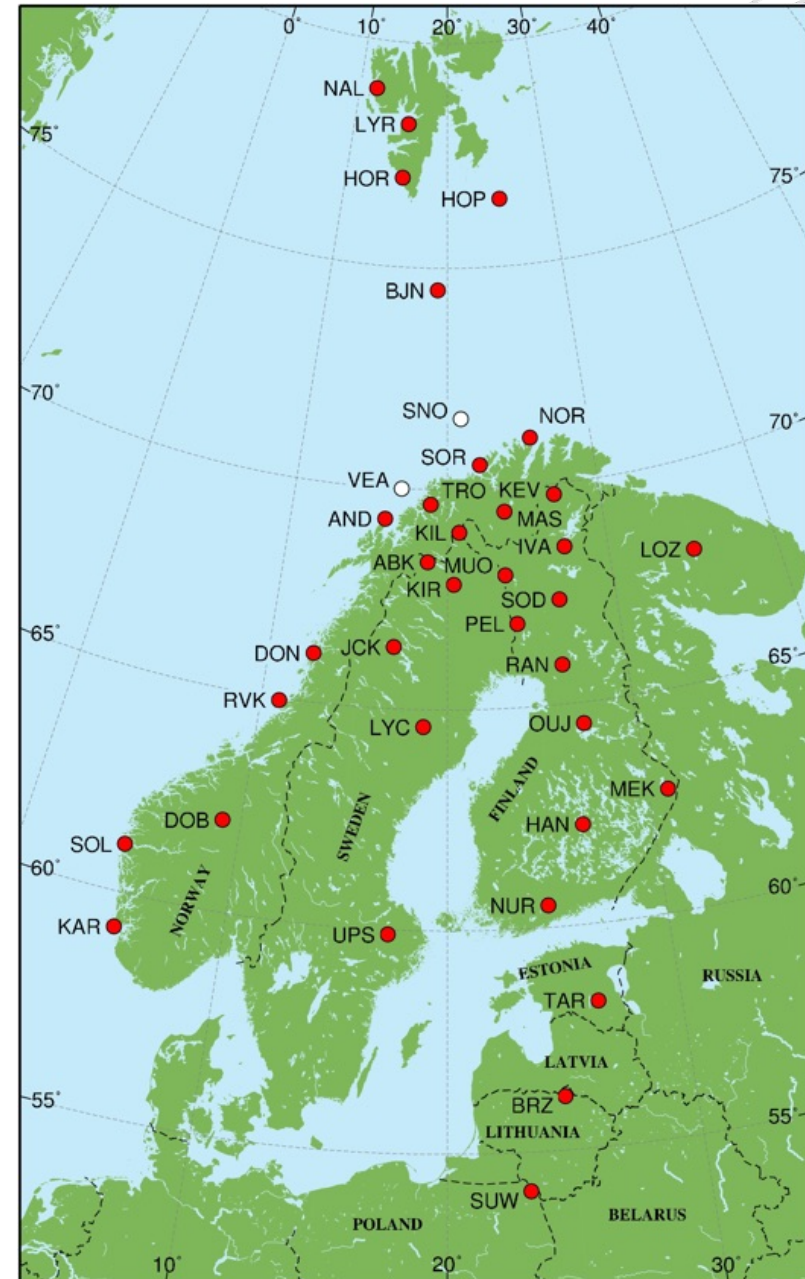
- Total 35 magnetometers covering from 54 to 79 geom. lat.  
→ Better latitudinal coverage to monitor extreme solar storm effects.
- Upgrade from 10 s resolution to 1s resolution.  
Higher resolution data currently provided by NUR, SGO, RAN and KEV.
- Capability to monitor ultra-low frequency waves in addition of substorms and GICs.



# Station map in 2015

## IMAGE+ magnetometers in 2015

- 35 magnetometers of which 4 are observatories (NUR, SGO, ABK, TGO) and 31 variometers.
- Resolution 10 and 60 s provided by most.
- 1s resolution data from NUR, SGO, RAN and KEV.
- Planned stations to Vesterålen (VEA) and Snohvit (SNO).





# Road maps, science projects and services with IMAGE+ data

- EPOS in European infrastructure road map ESFRI. Within top-3 infrastructure within Europe.
- FIN-EPOS in Finnish infrastructure road map FIRI, 2014 onwards.
- GEPOS: Geoscientific infrastructure within FIN-EPOS.
  
- ReSoLVE Centre of Excellence on Solar long-term variability and effects, led by K. Mursula, MAGNETIC team at FMI lead by E. Tanskanen, 2014 – 2019.
- Birkeland Space Centre, Centre of Excellence in Norway, led by N. Østgaard, 2012 – 2020.
  
- European Space Agency, Space Situational Awareness (SSA) Service Centre for Geomagnetism, TGO, FMI, DTU.
- EXWE on solar storm effects to critical Finnish infrastructure incl. nuclear power plants.
- Substorm Zoo browser-based social data analysis tools in collaboration with local nano-companies.
- KRIVAT 24/7 space weather services for Finnish government.
- LUOVA 24/7 services for authorities and companies.





# IMAGE+ reference and contact info

- Participating institutes:  
Tromsø Geophysical Observatory Norway, Finnish Meteorological Institute, Sodankylä Geophysical Observatory, IRF Sweden, Tartu Observatory Estonia, Polish Institute of Science, Potsdam Germany.

- Official reference paper: Tanskanen et al., From Space weather to space climate: substorm analysis during solar cycles 22 and 23, 116, JGR, 2011.

- Data:

**<http://www.ava.fmi.fi/image/>**

**<http://space.fmi.fi/image/beta>**

**[www.substormzoo.org](http://www.substormzoo.org)**

- Principal investigator contact info: [Eija.Tanskanen@fmi.fi](mailto:Eija.Tanskanen@fmi.fi)