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2024-11-20 Googling:

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# Ionosphere D-F regions:

* D region: 60-90 km
* E region: 90-150 km
* F region: 150-1000 km

# ALIS\_4D:

* 5 cameras (Kiruna, Esrange, Abisko, Tjautjas/Gällivare, Silkkimuotka/Nedre Soppero).
* Overlap of the field of view so that they can do tomography of the aurora, to see it in 3D.
* Urban Bränström
* Data: <https://www.irf.se/en/observatory-activities/allsky-camera/>, <https://www.irf.se/allsky/data.html>,
* The all-sky camera exposes one image per minute.
* Questions:
  + Can ALIS\_4D data be used to resolve why dB/dt spikes in non-stormy times?
  + Hur får jag tag i data? Open access?
  + Hur jobbar man med datat?

# VIIRS

* Visible Infrared Imaging Radiometer Suite (VIIRS) is a sensor on board the polar-orbiting Suomi National Polar-orbiting Partnership. Launched 2011.

# DSCOVR: Deep Space Climate Observatory

* Launched 2015. NASA/NOA. L1.

# CHAMP

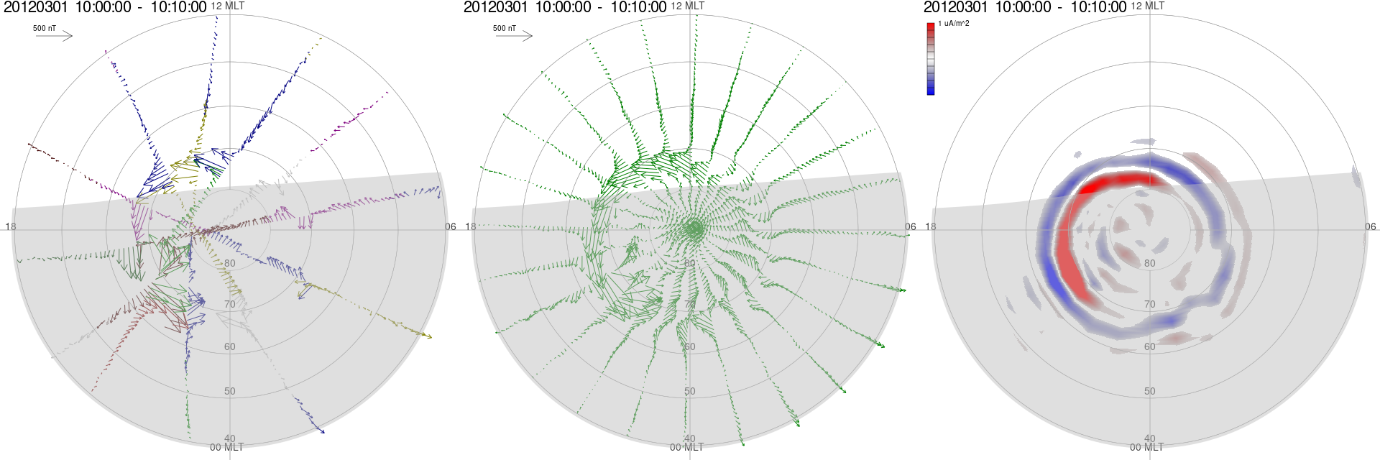
* 2000-2010 (was replaced by Swarm)

# SWARM:

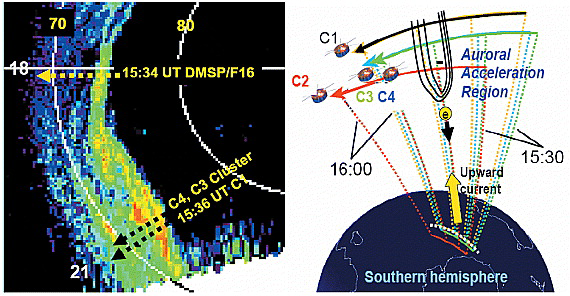
* Is successor of Champ.
* Launched 2013.
* 460km x2, 530 km x1

# AMPERE/Iridium:

* 780 km, 6 equally spaced orbital planes with at least 11 spacecraft in each plane.
* Upward currents are shown in red and downward currents in blue. Currents from my event in Hamrin+ 2023, Fig. 1a-c: 2012-03-01 09:30-14:00 UT:



# DMSP:

* 830 km
* Marklund+ 2011 (DMSP16): 5 June 2009, 15:30-16:00 <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2011JA016537>   
  
* DMSP satellites equipped with the SSUSI imager provide high-resolution (∼10 km at nadir) auroral images (Paxton et al., [2002](https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020JA028808#jgra56385-bib-0061)). Moreover, the DMSP satellites measure simultaneously auroral energy spectra of ions and electrons, magnetic field perturbations, ion density, temperature, and plasma flows by a set of the instruments onboard. (<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020JA028808>)
* SSUSI overview with links to data (drop-down “Data” and “Gallery”): <https://ssusi.jhuapl.edu/home_overview>

# THEMIS ground-based network:

* 20 ground stations in Notrh America, managed by the University of California's Space Sciences Laboratory (SSL).
* Data from GBOs (GMAG and ASI) also from, and check summary plots <https://themis.igpp.ucla.edu/overview_data.shtml>

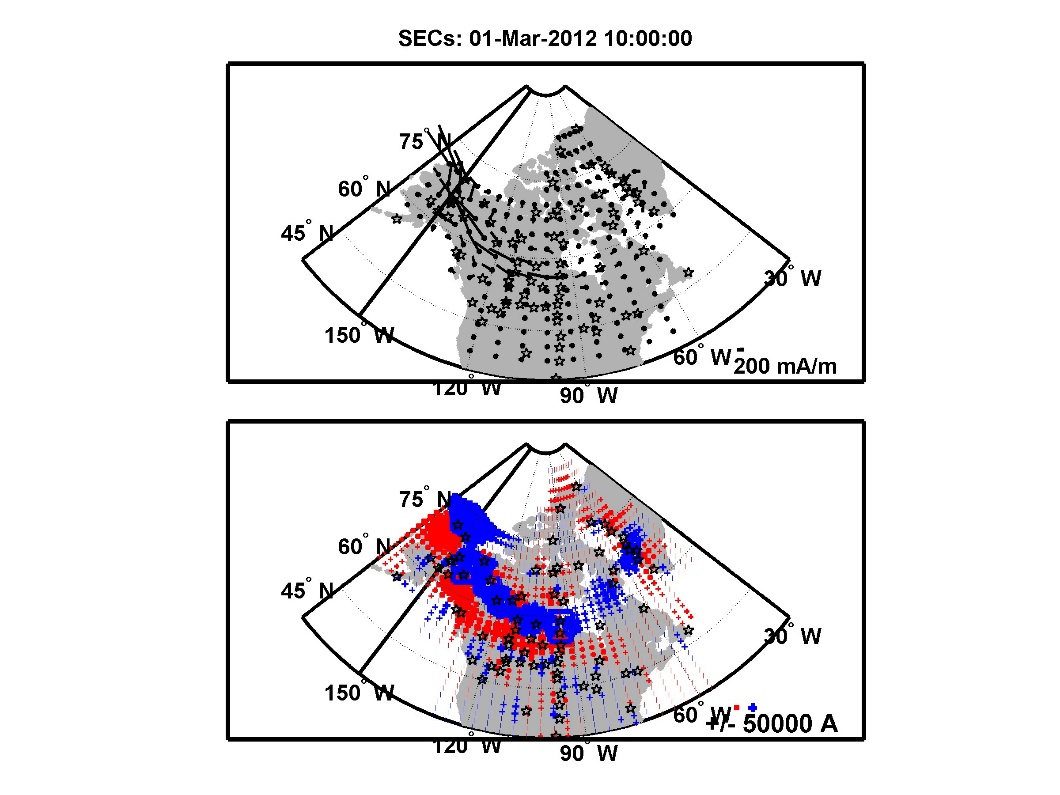
# Spherical elementary current systems (SECS):

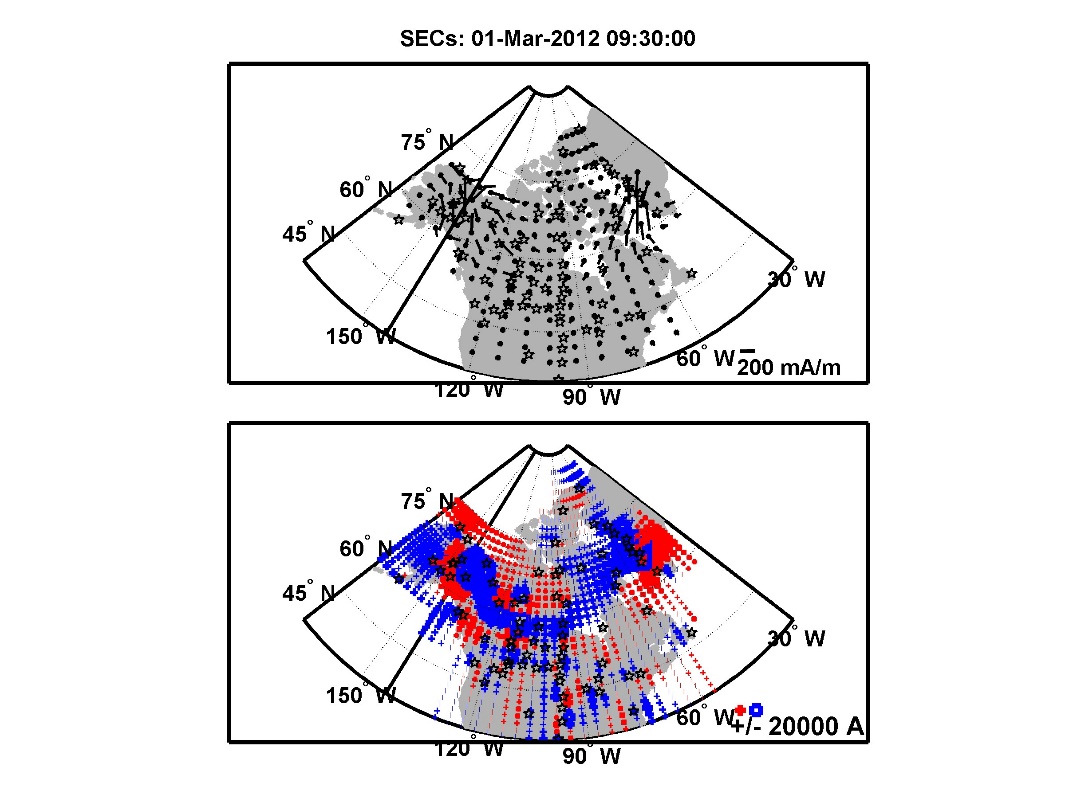
* Heikki Vanhamäki: University of Oulu, who has been involved in the research and development of methods using: Spherical elementary current systems (SECS), Methods derived from (SECS):
  + Equivalent currents
  + Local Mapping of Polar Ionospheric Electrodynamics (Lompe)
  + Assimilative Mapping of Ionospheric Electrodynamics (AMIE, KRM)

# Equivalent currents FMI:

* 100 km. ID and 2D.
* <https://space.fmi.fi/image/www/index.php?page=equiv_currents_1D>

# Equivalent currents THEMIS:

* There should be such?
* Quicklook SECS: <https://spdf.gsfc.nasa.gov/pub/data/aaa_special-purpose-datasets/spherical-elementary-and-equivalent-ionospheric-currents-weygand/Quicklook/>   
  <http://vmo.igpp.ucla.edu/data1/SECS/Quicklook/>
* Upper directory: <https://vmo.igpp.ucla.edu/data1/SECS/>
* README: <https://spdf.gsfc.nasa.gov/pub/data/aaa_special-purpose-datasets/spherical-elementary-and-equivalent-ionospheric-currents-weygand/Weygand_readme.txt>:
* “SECS are the current amplitudes are a proxy for the field aligned current” and EIC are horizontal.
* James M. Weygand (the author of this dataset) [jweygand@igpp.ucla.edu](mailto:jweygand@igpp.ucla.edu)
* Currents from my event in Hamrin+ 2023, Fig. 1a-c: 2012-03-01 09:30-14:00 UT
* THEMIS GMAGs: <https://themis.ssl.berkeley.edu/data/themis/thg/ascii_data/>



* MH exjobb note: We will of course have “normal current systems” also during non-stormy times. But the student could look at how changes in different currents systems give rise to the various db/dt spikes? See Fig. 8 in Hamrin+ 2023. Yama’s idea of diffuse auroras giving high dB/dt is perhaps not as relevant.

# Automatic aurora image classification: Noora Partamies

* JC 2024-11-21: Working with automatic (?) identifications of auroral signatures.

# Automatic aurora image classification: Other

* Zhong+ 2020, Automatic Aurora Image Classification Framework Based on Deep Learning for Occurrence Distribution Analysis: A Case Study of All-Sky Image Data Sets From the Yellow River Station. <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019JA027590>
* Kvammen+ 2020: Auroral Image Classification With Deep Neural Networks. <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020JA027808>

# e-POP is a research payload on the CASSIOPE spacecraft

It has an auroral imager, magnetometer, and ion mass spectrometer! Also called Swarm-E. Altitude 683 km. Launched 2013?

# TRACERS

NASA mission, launch April 2025. Low Earth Orbit. Has, among others, a magnetometer.