Progress report on the SuperDARN Hokkaido East / West (HOP East / East) radars in 2014

SuperDARN北海道-陸別第一・第二HFレーダーの2014 年現況報告

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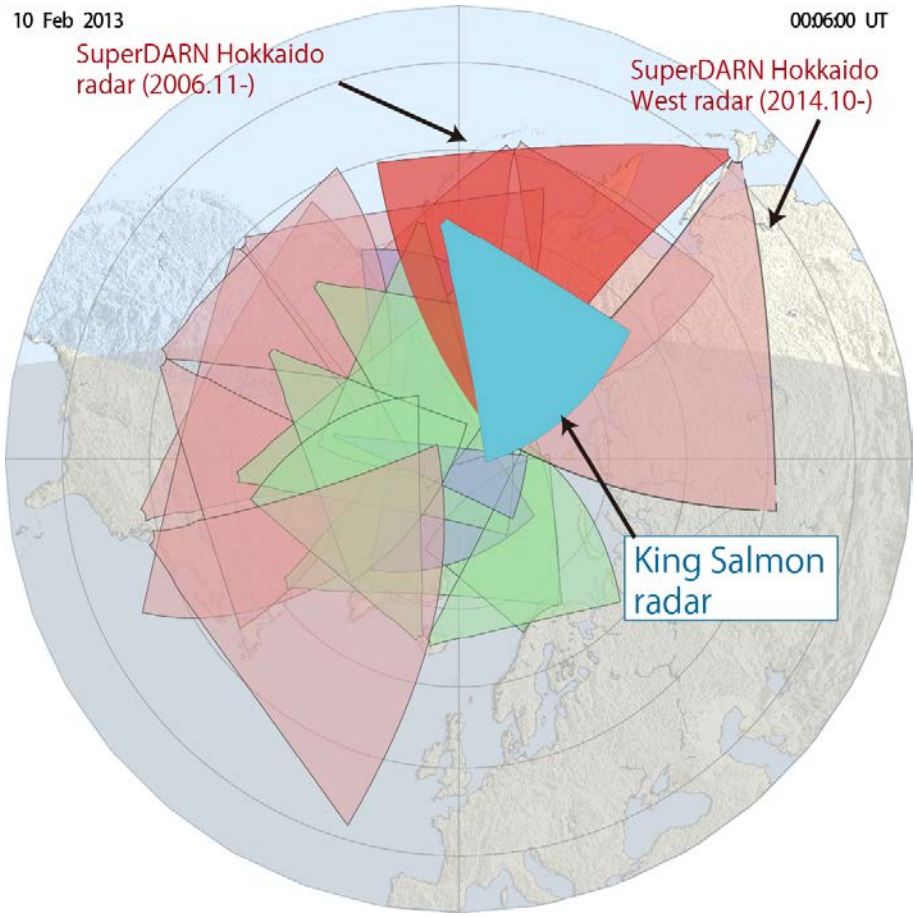
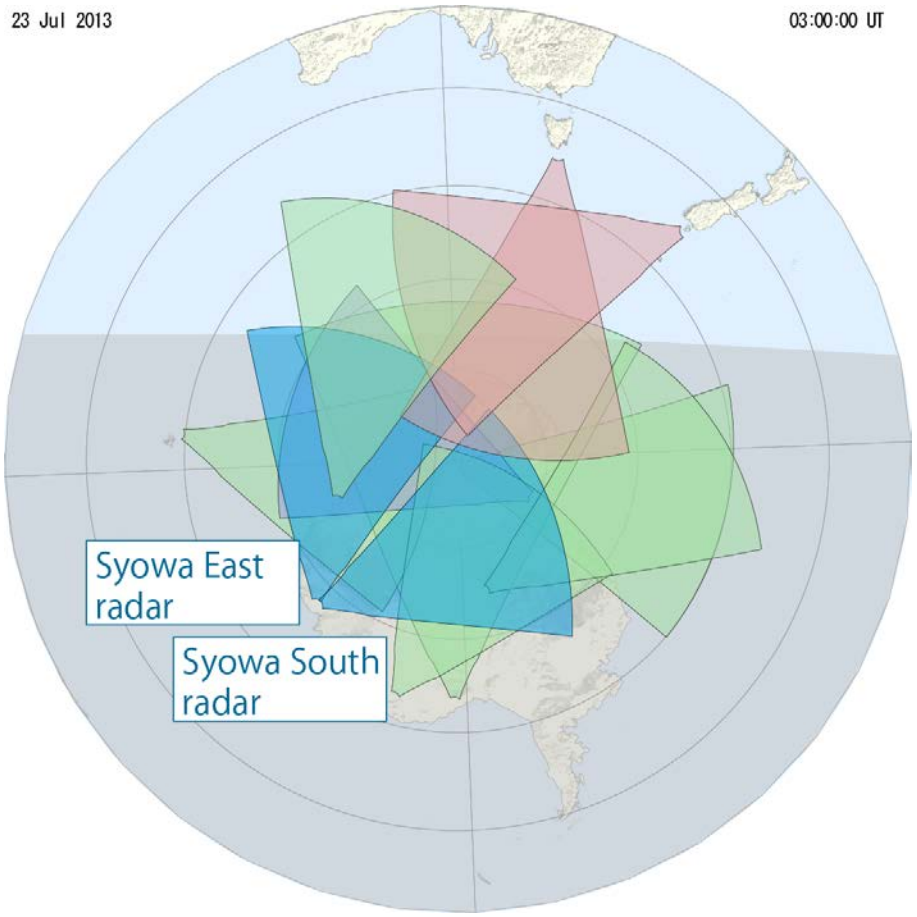
Super Dual Auroral Radar Network (SuperDARN)

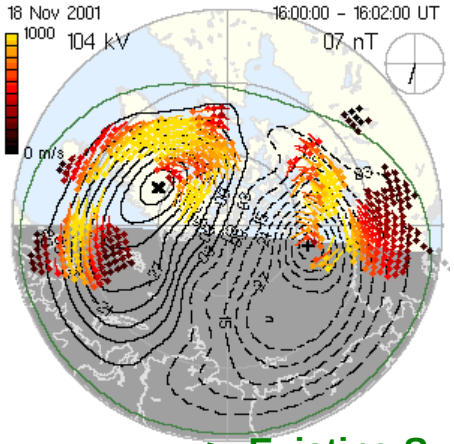




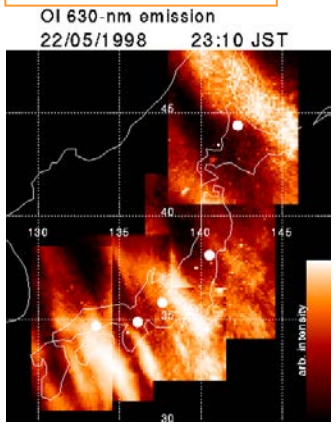
Number of operating HF radars: 34 (23 in the northern and 11 in the southern hemispheres) as of Oct 24, 2014

Standard temporal resolution: 1-2 min

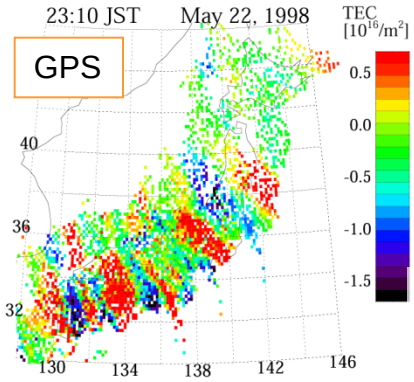
SuperDARN Hokkaido radar (2006.11-) # of papers: 24



Airglow imagers

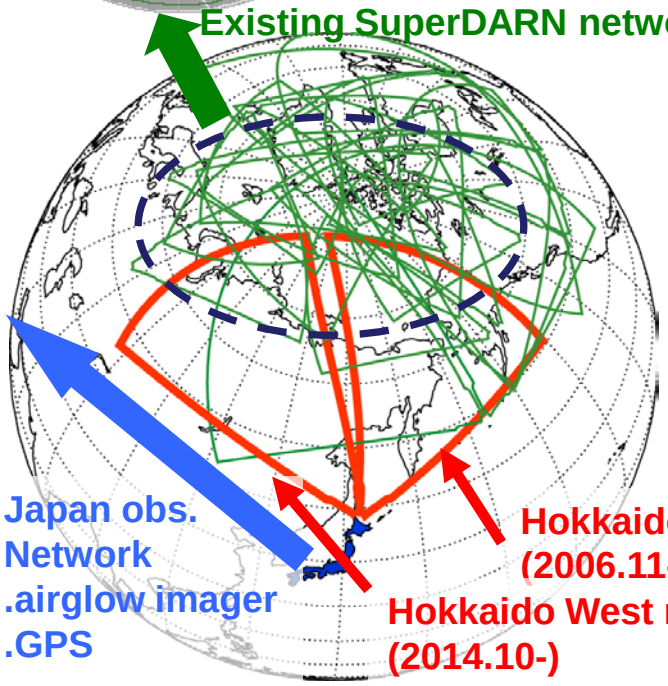


GPS



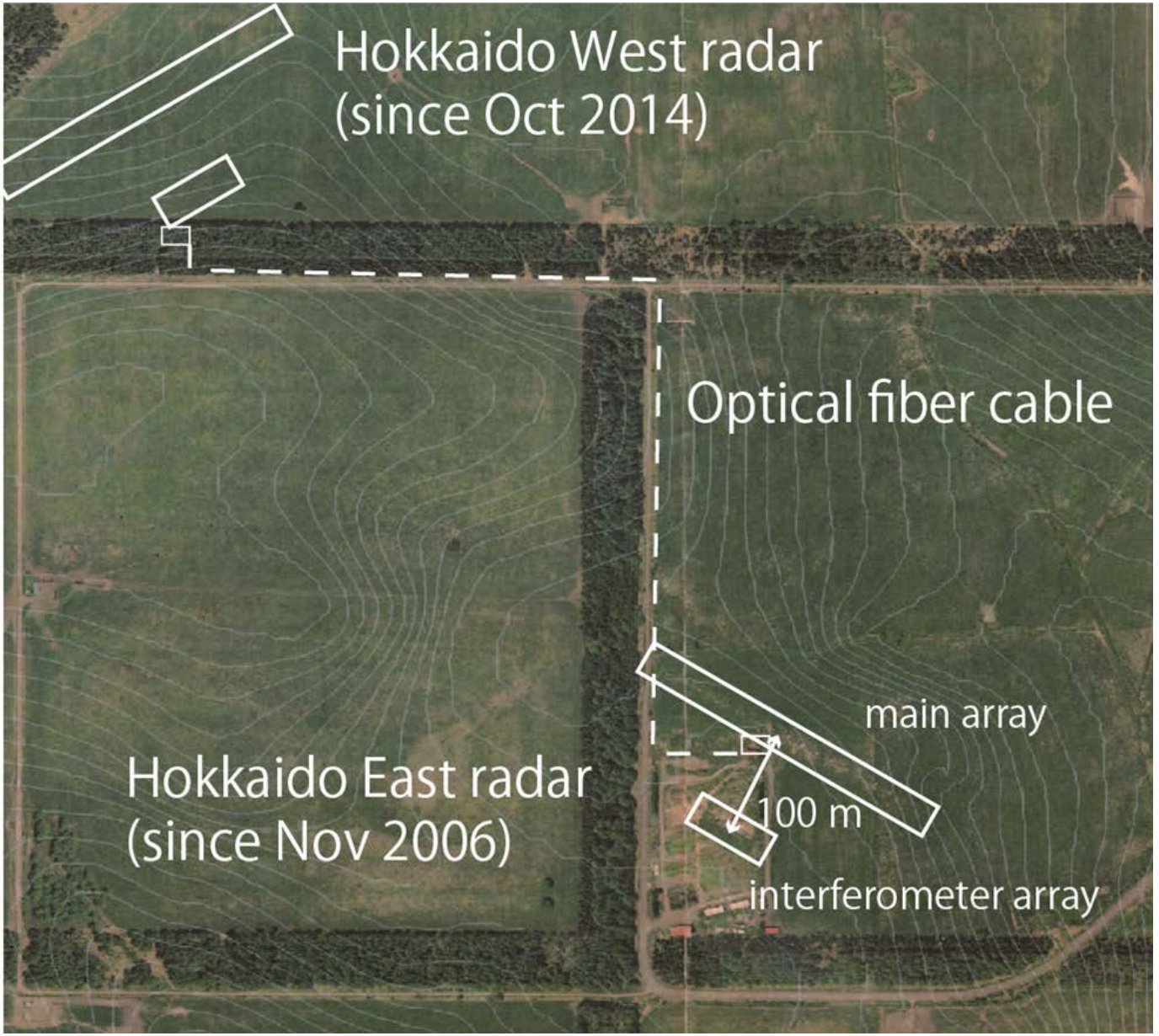
The Hokkaido radar covers 38-80 geomag. lat, Corresponding to L= 1.6 to 33

Study of ionosphere, thermosphere and upper mesosphere



Unified understanding of the dynamics of the high- to mid-latitude upper atmosphere

Location of HOP East / West radars



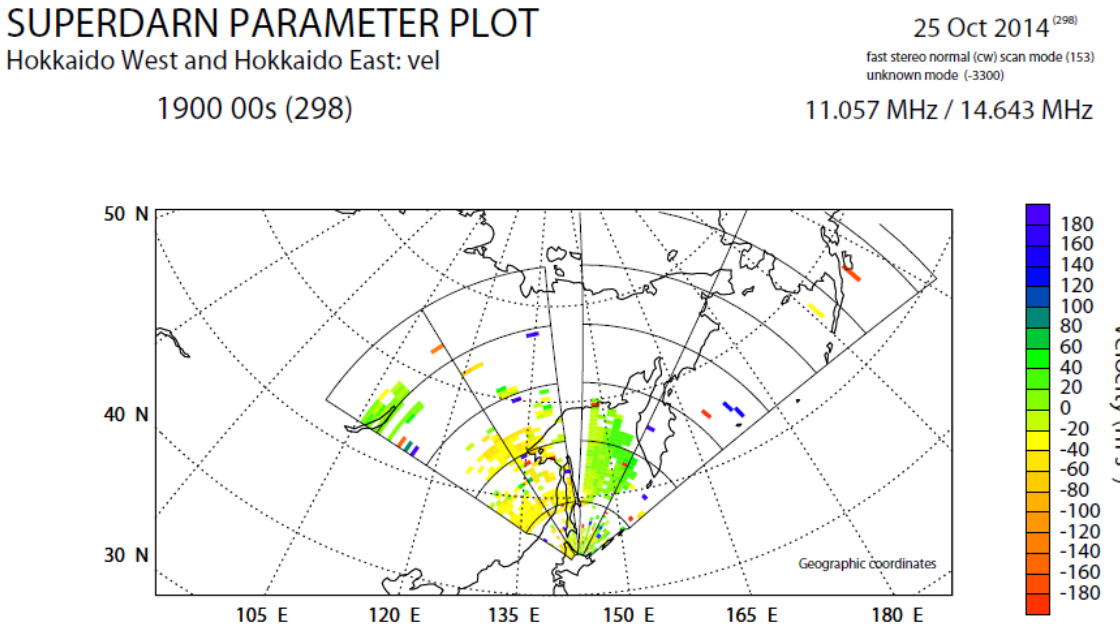
Progress of Hokkaido West radar (PART 1)

- Building of radar hut completed (2013.11)
- Antenna system completed (2014.9.2)
- Deadline extension for the usage of funds to FY 2014 approved (announced on 2014.9.16)
- Tentative radio license approved(2014.10.13)
- Tx / Rx system, completed at Univ. Leicester in the end of June, arrived at the radar site (2014.10.21)

Progress of Hokkaido West radar (PART2)

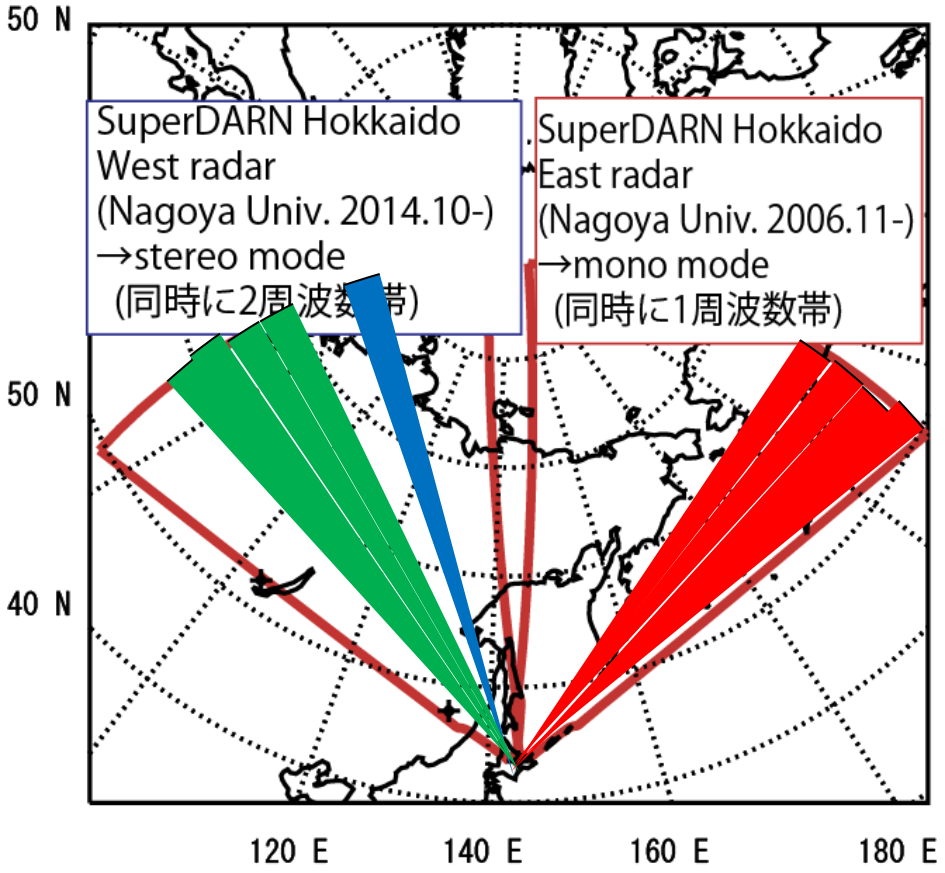
- Licensing test (2014.10.21-24)
- Emit the radio wave→first light! (2014.10.24)
- The radar has been stopped due to fixing of the antenna element problem (2014.10.28-29)
- Operating continuously since 2014.10.29

Licensing test



Hokkaido East / West initial plot

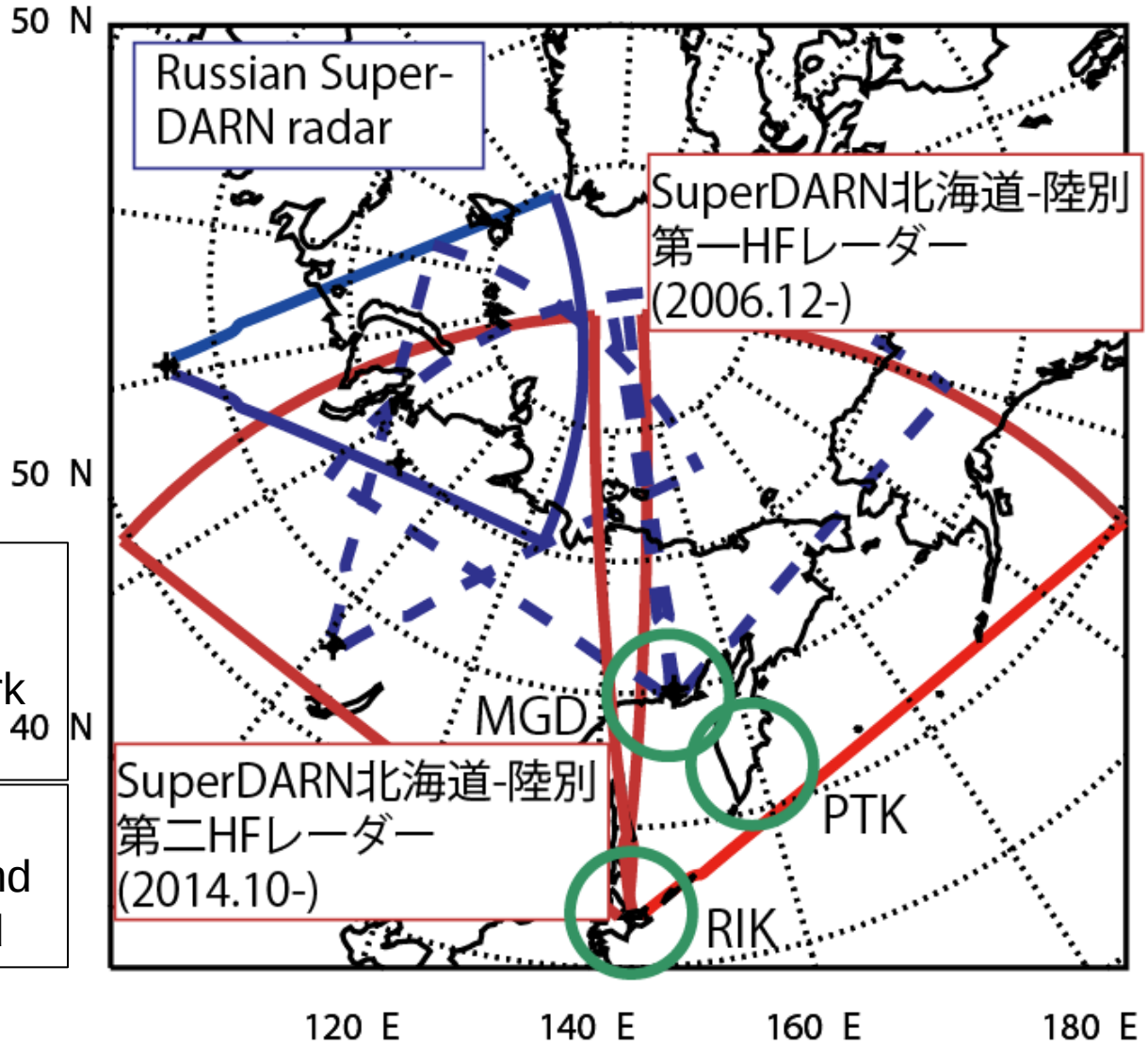
New scientific objectives using Hokkaido East / West radars (M-I coupling)



Hokkaido West radar: stereo mode

- Sampling two beams simultaneously
- Simultaneous observation of 1m 2D data and 1-3 s one beam data
- Useful of the studies of spatial / temporal characteristics of ULF waves, short time scale phenomena such as SCs / substorms
- Three beams in the field of view of Hokkaido East / West radars can study Pc3 / Pi2 longitudinal wave number (m number) in detail
- It might be possible, by using raw data samples, to study ULF waves with periods shorter than 3 s
- Conjunction studies with ERG and other spacecraft are highly anticipated

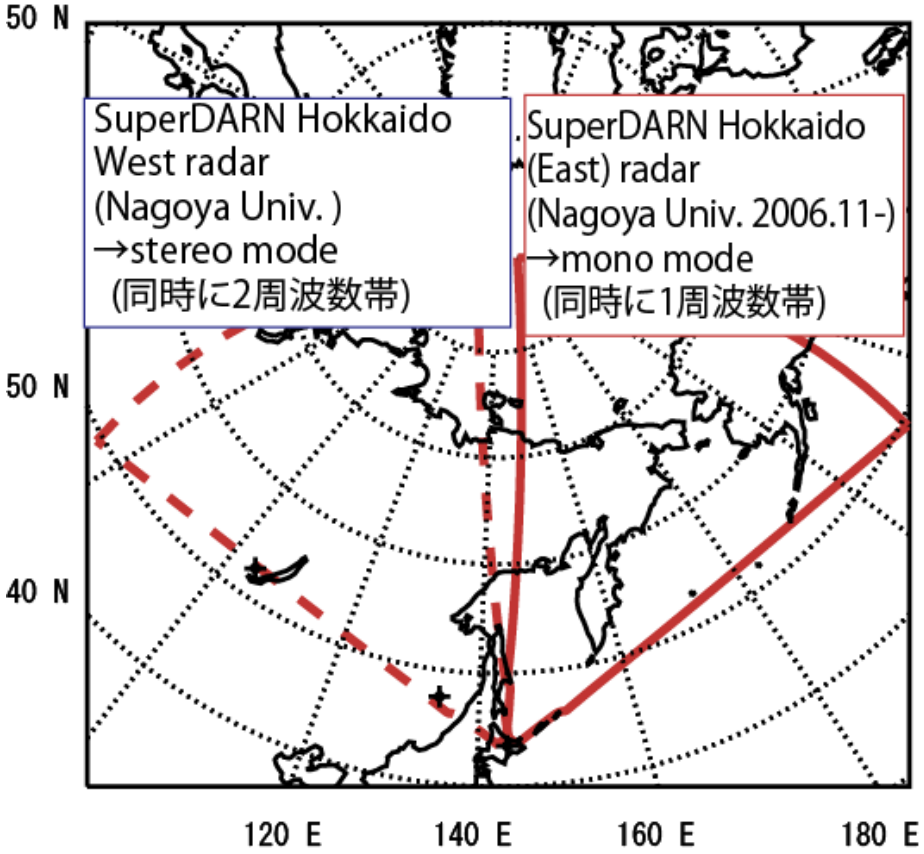
Russia-Japan Joint Research Program (2012-2013 FY, collaboration continuing)



Plus Irkutsk Is radar, chirp sounding network etc.

Joint proposal between IKIR and Japan submitted

New scientific objectives using Hokkaido East / West radars (MTI coupling)



Hokkaido West radar: stereo mode

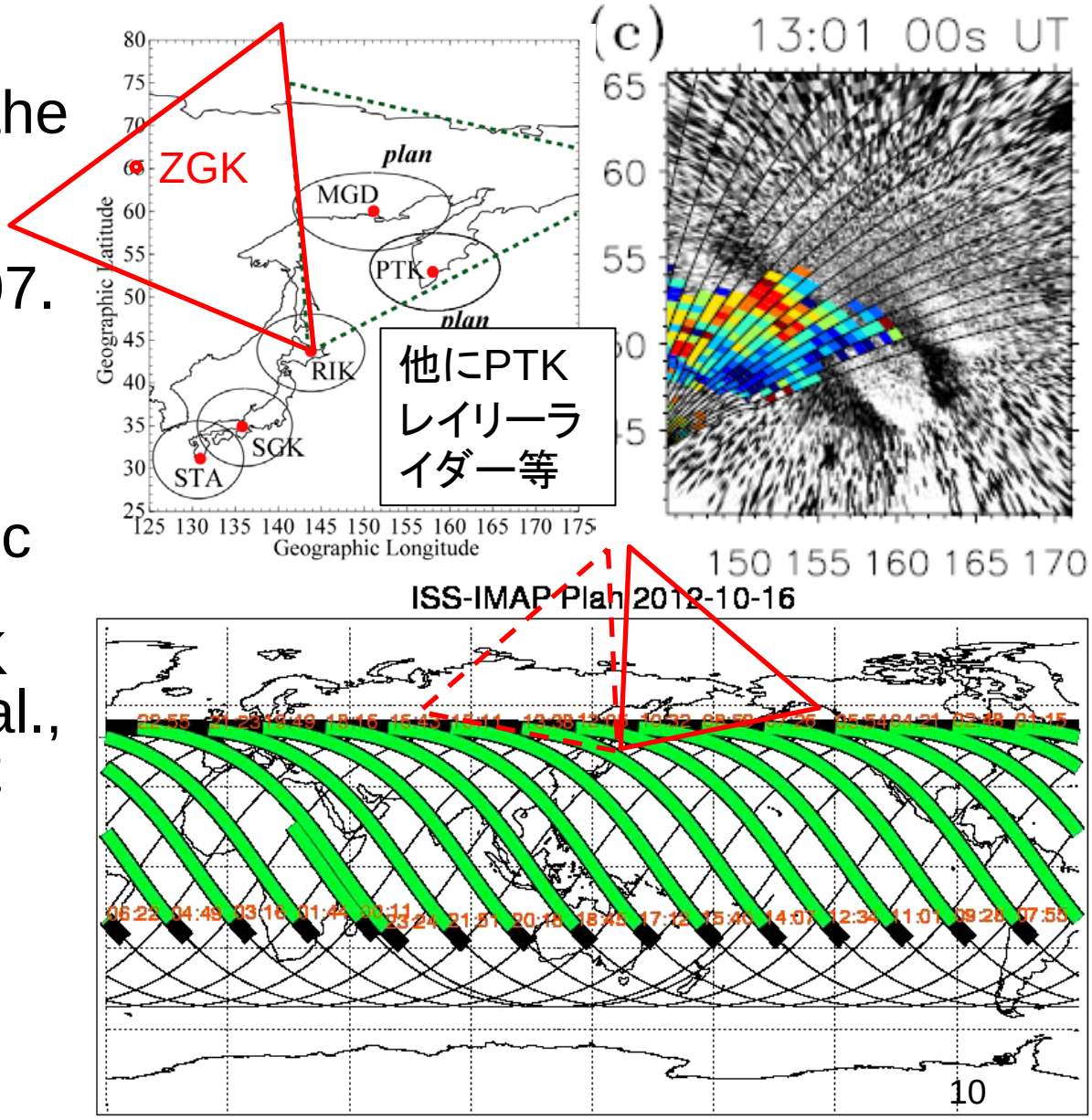
- Simultaneous observation of 1m 2D data and 1-3 s one beam data
- Useful for the studies of rapid propagation phenomena such as coseismic disturbances

West radar: possible to use 2 frequencies simultaneously

- 3 freq observation with 2 radars
- Useful for the studies of altitude dependence
- Studies of TIDs, solar flare effects, coseismic disturbances etc. are promising

Collaboration with optical imager from the ground and space

- Joint observation by the HF radar and airglow imager has been operational since 2007.
- MSTIDs observed by the ground optical imagers is highly correlated with electric field disturbance observed by the HOK HF radar (Ogawa et al., JGR, 2009; Suzuki et al., JGR, 2009).
- Similar conjunction study with ISS-IMAP (2012.07-) is also planned.

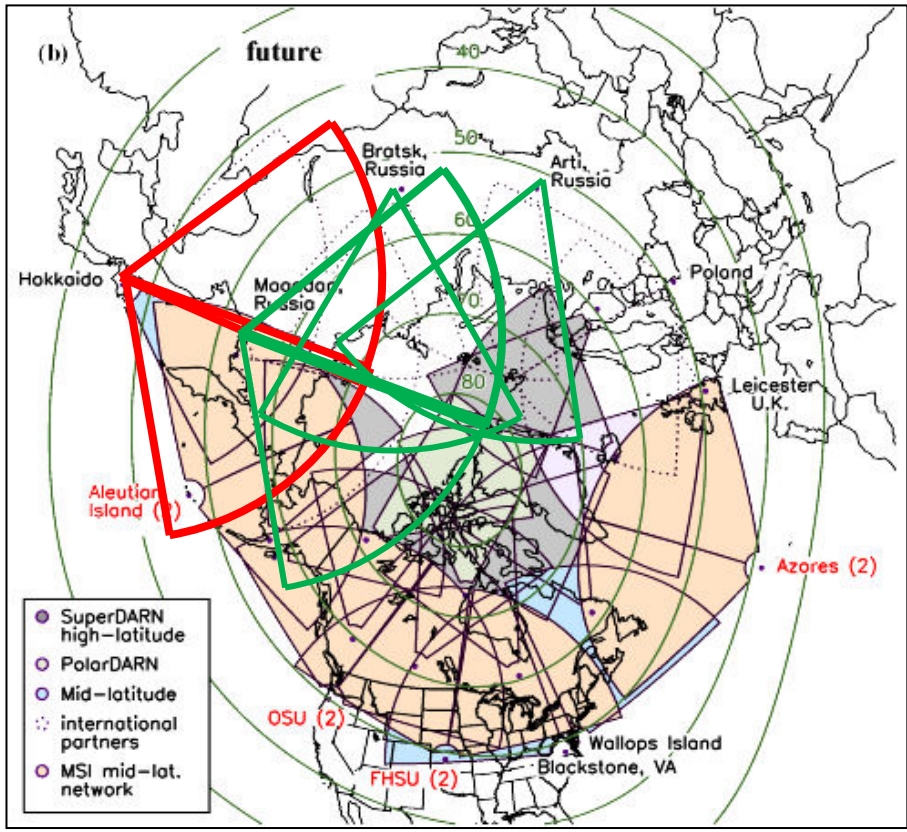


SuperDARN Hokkaido East / West radars and international collaboration

- Japan-USA collaboration
  - Trans North America subauroral region (50-60 geomag. Lat.)
  - Hokkaido West Operation started in October 2014
  - Almost all the American radars, except for Azores, are in operation

- Japan-Russia collaboration
  - Siberian SuperDARN (JSPS-RFBR, H24-25)
  - Ekaterinburg radar started in Feb. 2012, other 3 radars will be operational within 2 years
  - Collaboration with other observation (HF Doppler, IS radar etc.)

- Japan-Australia collaboration
  - TIGER 3 will be operational soon
  - Conjugate study in subauroral and midlatitude regions



- Japan-China collaboration
  - China is proposing to build SuperDARN radars in mainland China
  - Their FOVs will overlap with those of Hokkaido East / West and other radars

Summary

- SuperDARN Hokkaido West (HOP West) radar started operation on 014.10.24
- Simultaneous observation of 1m 2D data and 1-3 s one beam data becomes possible using the stereo mode
- New scientific objectives using Hokkaido East / West radars
  - Study of short time scale / rapidly propagating phenomena
    - ULF waves, SCs, substorms etc.
  - Establishment of the monitoring network on a global scale
- New Nickname for Hokkaido East / West radars
  - HOP (HOkkaido Pair of) radars
    - SuperDARN HOP East, SuperDARN HOP West

Summary (cont.)

- The HOP (Hokkaido East / West) data are accessible via TDAS / SPEDAS (formerly UDAS) tools, the latter of which is prepared by IUGONET. If you install the SPEDAS, you can easily access, download, visualize and analyze the observation data through the Internet. Please click and try to use the SPEDAS.

- Expansion of midlatitude SuperDARN radars on a global scale is remarkable (total number of radars: 10!)
  - Much to do with the study of midlatitude phenomena on a global scale (ULF, convection etc.)
    →Now it's time to get involved!
  - Newcomer is highly welcome!

Special issue of Earth, Planets and Space

- Title: "Coupling of High and Mid Latitude Ionosphere and Its Relation to Geospace Dynamics"
- It is open to everyone, including those who did not make presentations at AOGS 2014 in Sapporo
- Deadline: 31 Dec 2014
- Expected publication date: June 2015
- APCs for EPS special issue:
  - Letter articles (less than 8 pages): 100 Euros regardless of membership.
  - Full papers or Technical Reports: normal APCs apply;
    - 200 Euros for members and 600 Euros for non-members.
- Note that EPS journal does not accept review papers
- Impact factor of EPS in 2013: 3.06 (2012: 2.92)

Discussion topics

- ERG-SuperDARN conjunction mode
- Hokkaido (HOP) West operation modes
- EPS special issue paper submission
- Equatorial / low latitude HF radar ?
- Future workshops
- Future SuperDARN Workshops in Japan

Future workshops

- Possibility of merging NIPR / NICT / STEL SuperDARN workshops to include both mid-latitude and high-latitude topics
- Is it limited to SuperDARN talks or open to all the related topics?
  - Former one: deep discussion about SuperDARN possible but number of participants limited
  - Latter one: more participants can be expected but the SuperDARN proper talks will be somewhat restricted (especially technical issues)