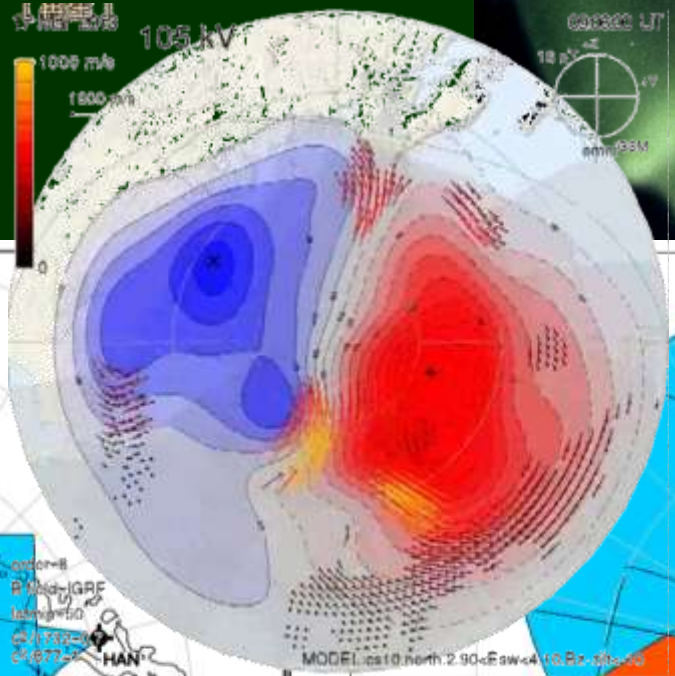
SuperDARN概要と最新情報
SuperDARN overview and updates

A. Sessai Yukimatu
NIPR/SOKENDAI

SENSU Syowa South radar taken by Mr. Yasuo Kato, a UAP member of JARE36 in 1995

SuperDARN overview and updates

Still growing surprisingly…!



Hokkaido

King Salmon

Iceland

SENSU Syowa
Since 1995~

NIPR: Polar region
NICT : Space Weather
Nagoya: Mid-Latitude

N.H. SD 2016

New SD radars

Courtesy of M. Lester
SD2016 Workshop

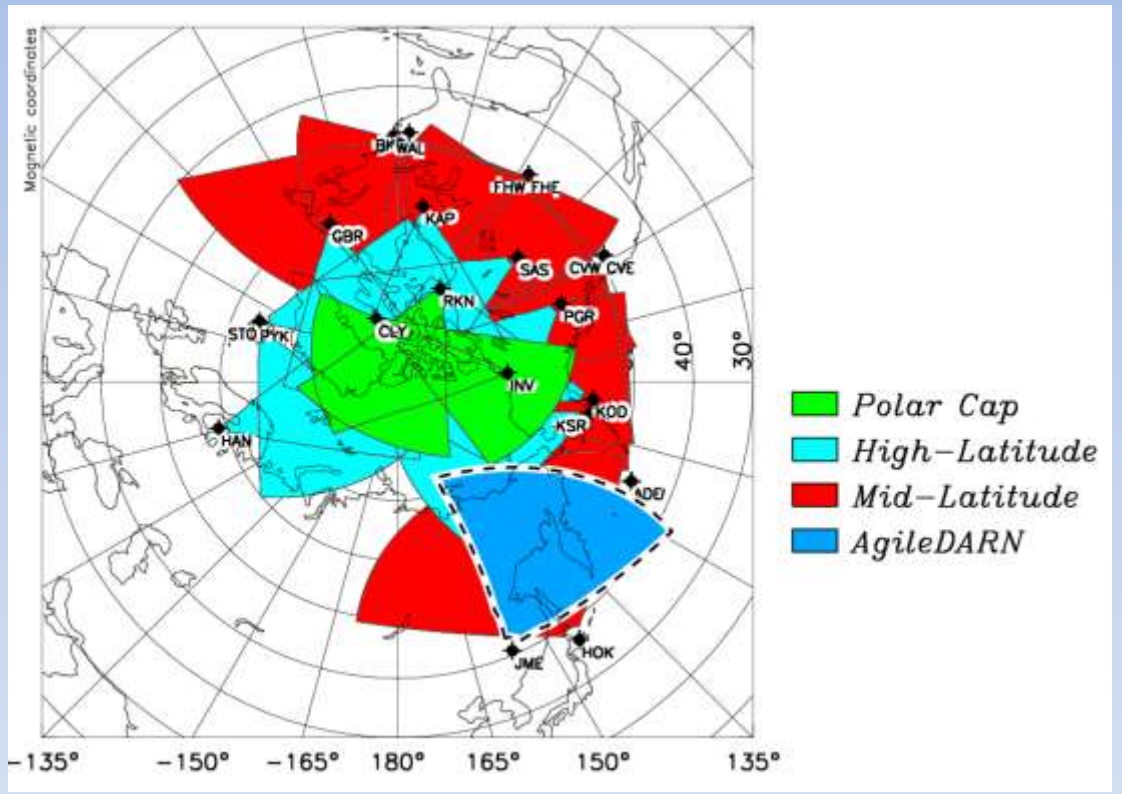
- **New radars:** The **Longyearbyen radar (PI Dag Lorentzen)** has been successfully deployed in November 2015 and is currently undergoing a lengthy period of commissioning during which time data have been taken.
- There has been a hiatus in the deployment of the final two MSI radars which were going to be located in **Ireland (PI Simon Shepherd).** Hopeful that he will be able to deploy later in 2016 or in 2017
- Co-PIs Mark Lester, Jim Wild and Aurelie Marchaudon have identified a potential radar site for **the southern France radar at Lannemezan,** to the south west of Toulouse. Unfortunately it looks as if we may be delayed here also due to potential interference problems between the SuperDARN radar and a VHF wind profiler radar
- **Dome C North** is planned for deployment in the austral summer of 2016-17 (PI Federica Marcucci)
- There is potential for re-deployment of a radar on the **Falkland Islands** using refurbished electronics from Halley as a result of the new digital radar being deployed at Halley last austral summer. (PI Gareth Chisham) However, issues with the antennas may delay this.

UNIVERSITY OF LEICESTER

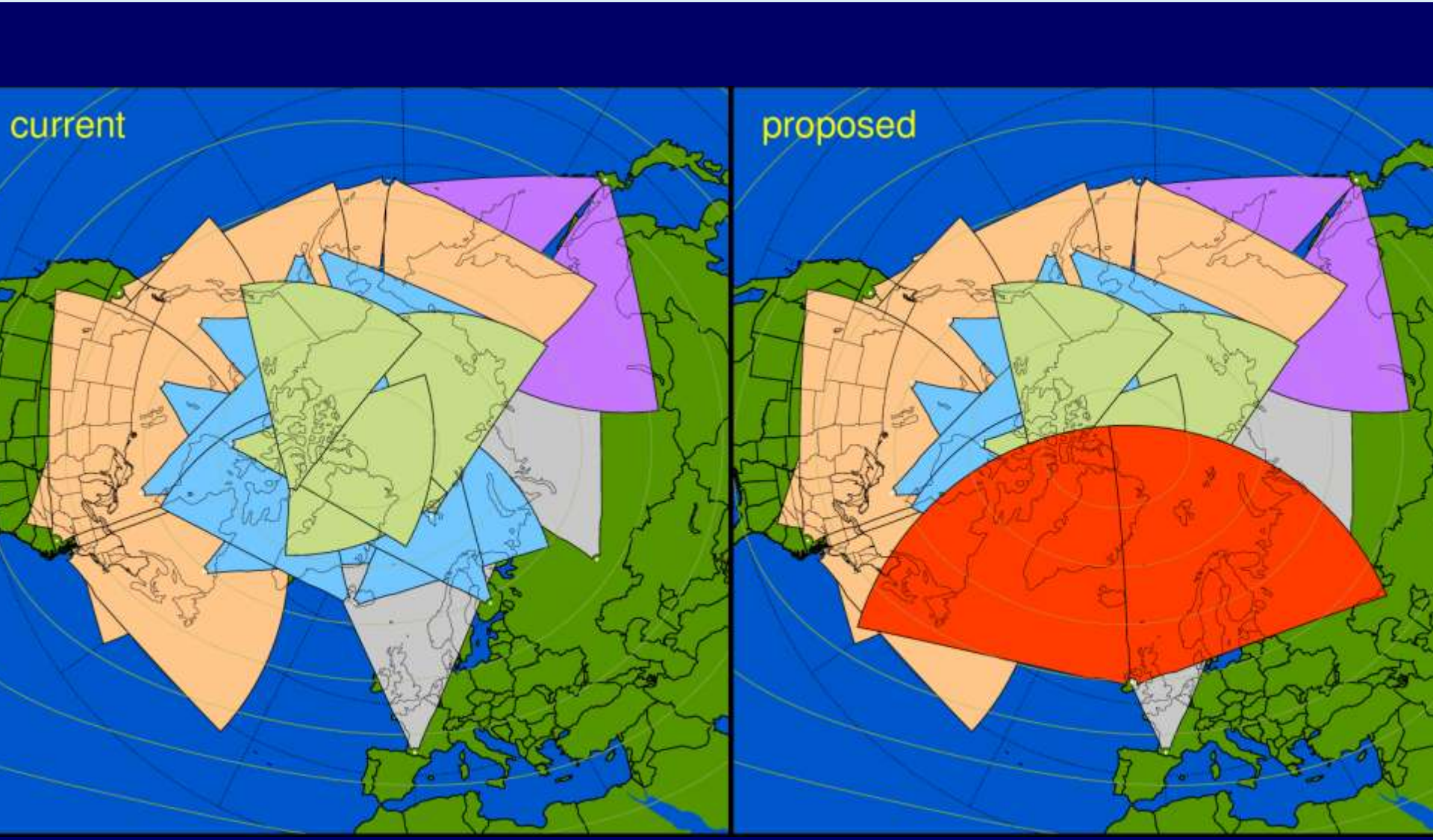
Courtesy of J. Zhang
SD2016 Workshop

Radar overview

- Support: National High-tech R&D Program of China
- Fund: 10 million RMB
  ~1.56 million $
- Period: Jan 2015~Dec 2017
- Location: the city of *Jiamusi*
- Coordinates:
  46.8° N,130.47° E(GEO)
  41.4° ,-155.6° (AACGM);
- Scan Direction: East
- Boresite: 44°



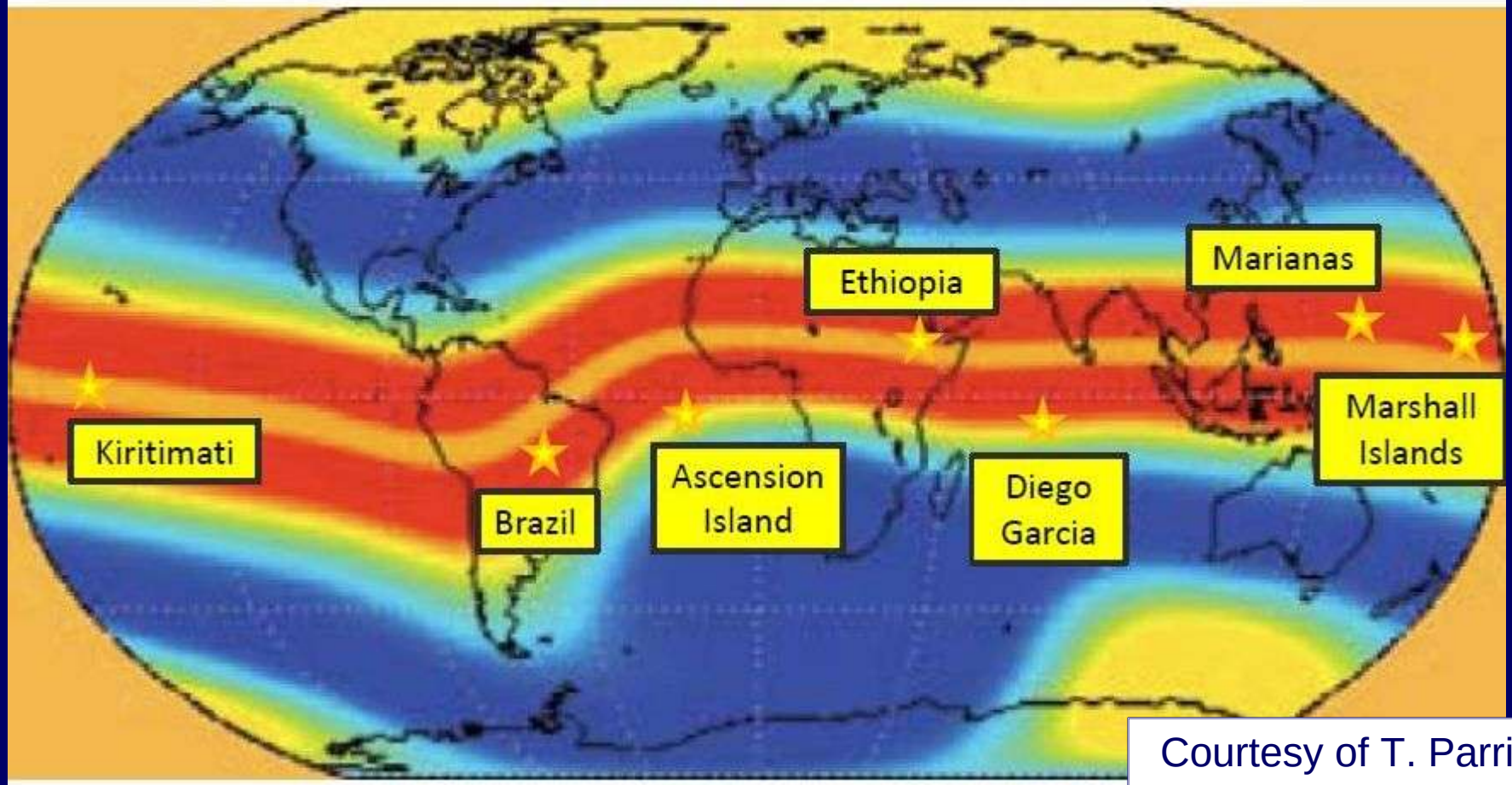
SD FOVs – still growing…



Courtesy of S. Shepherd

SD FOVs – non-SD but to equatorial region!

Sites considered



Courtesy of T. Parris
SD2016 Workshop

SuperDARN scheduling

・3種類のcategoryに分けられる。

Common Time(CT):

全radarが基本観測modeで観測。月の50%以上。
基本的に、PIとcontactの上、誰でも使える。
normal_scan、近年では、fast_scan/fast_sound mode。
更に、(元々STで実施していた)THEMIS衛星との
特別観測(themisscan mode)を、CT枠で実施している。

Special Time(ST):

全radarが特別な科学目的の為に特別なmodeで観測。
月の20%以下。
一定期間は観測提唱者にdata使用のpriority有。

Discretionary Time(DT):

各PIの裁量で観測可能な期間。
1~数レーダーによる特別観測やレーダー保守も
このcategory。月の30%以下。
一定期間は、各PIにdata使用のpriority有。

・2ヶ月前までにSD scheduling WGに計画と割当要求を提出し、
SD scheduling WGがSD PI Groupの承認を経て
1ヶ月前までにschedule決定。最小要求単位は、2時間。

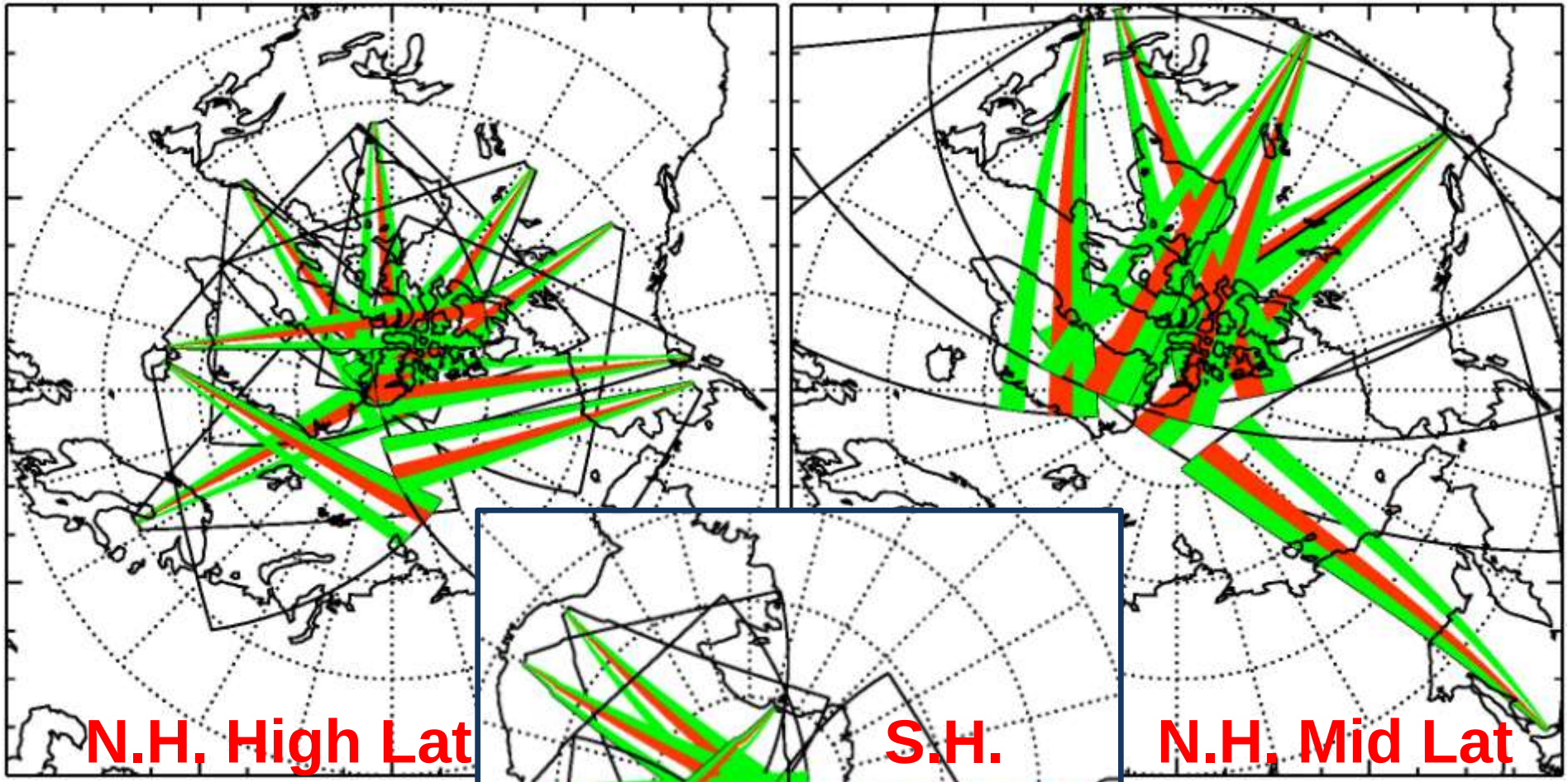
・stereo radarの場合、chBは、radar保有PIの自由裁量。

・CT/ST/DTは、cpid（program ID）で区別できる（筈だが混乱も有）。

SD RBSP mode (plan)

- **CT-TRIG** mode introduced
  When a storm happens, SD changes from the normal CT mode to RBSP special mode during CT
  - CT-TRIG data will be open like CT data
- **ST-APOG** mode introduced
  ST-APOG mode is scheduled in advance for period when RBSP is near apogee whose footprint is in one of SD FOVs
  – ST program but CT CPID will be assigned so ST-APOG data will be open like CT data
- Override
  CT-TRIG overrides ST-APOG
  Priority btw CT-TRIG and DT decided by each PI
  Priority btw ST and CT-TRIG decided by each PI
- Will be tested Oct – Dec, 2012, reviewed Jan 2013

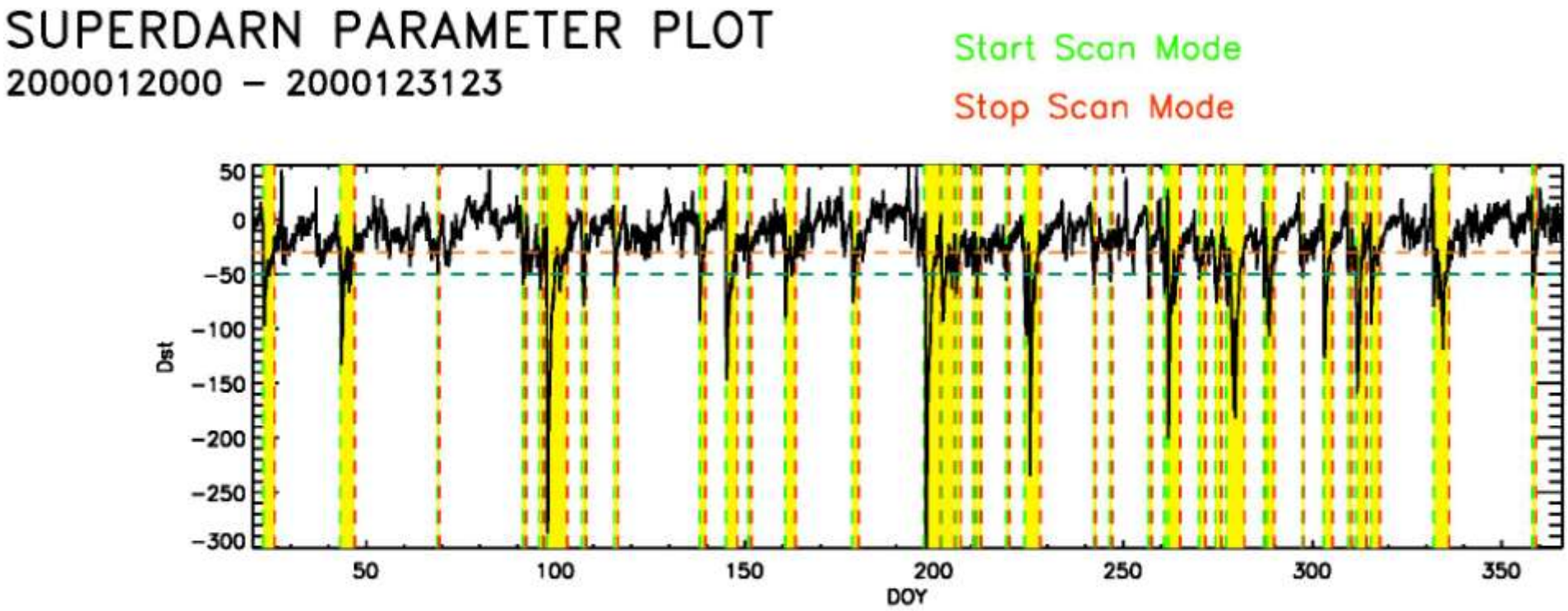
SD RBSP mode – CT-TRIG (plan)



Global Scan +
3 camp. beams
(n-1, n, n+2)

by Tim Yeoman

Simple Dst trigger algorithm



by Tim Yeoman

SuperDARN Scheduling in the Last Year

- Continuing scheduling support for the Van Allen Probes mission including:
    1. Pre-scheduled intervals (ST-APOG)
    2. Dst-triggered intervals (CT-TRIG)

  Thanks to the Spacecraft Working Group for identifying the conjunctions for the ST-APOG intervals.

- Spacecraft working group have also made large requests for THEMIS common time over the last year in support of MMS operations and new moon intervals – during some months THEMIS common time has been greater than 1-min common time.

- Large Discretionary Time intervals (>3 days) – Still scheduling these intervals as a priority every month. Tricky to balance scheduling of these with Spacecraft working group requests.

British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

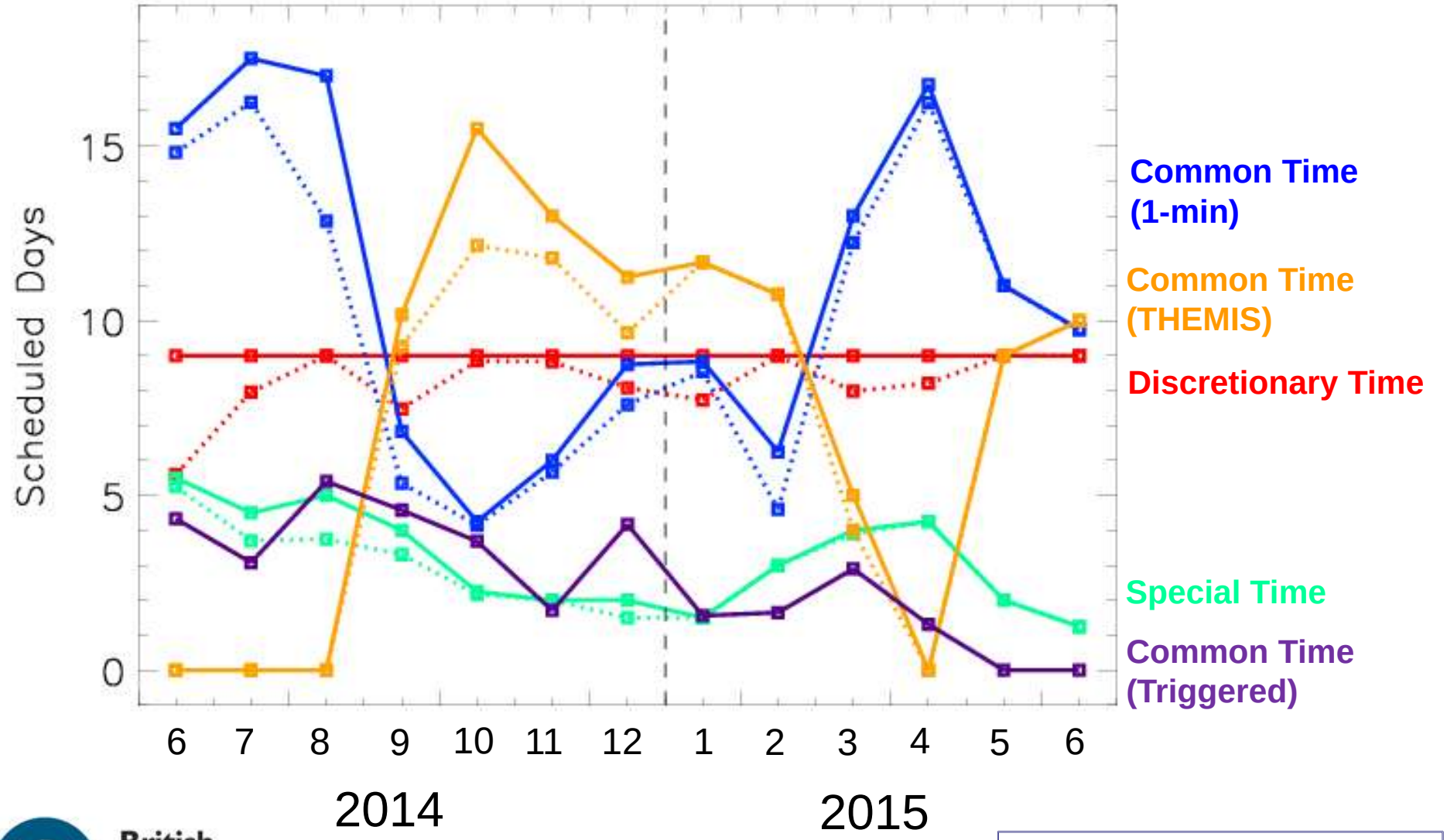
Courtesy of G. Chisham
SD2016 Workshop

CT-TRIG Intervals

- 45 (37 last year) triggered intervals in the last 12 months (to May 2016).
- These intervals cover 34.38 (22.56) days of operation in total.
- This represents ~9.4% (~6.2%) of time.
- For those groups not scheduling discretionary time at a higher priority than CT-TRIG – 10.27 (10.31) days of discretionary time lost to CT-TRIG over the last year.

Courtesy of G. Chisham
SD2016 Workshop

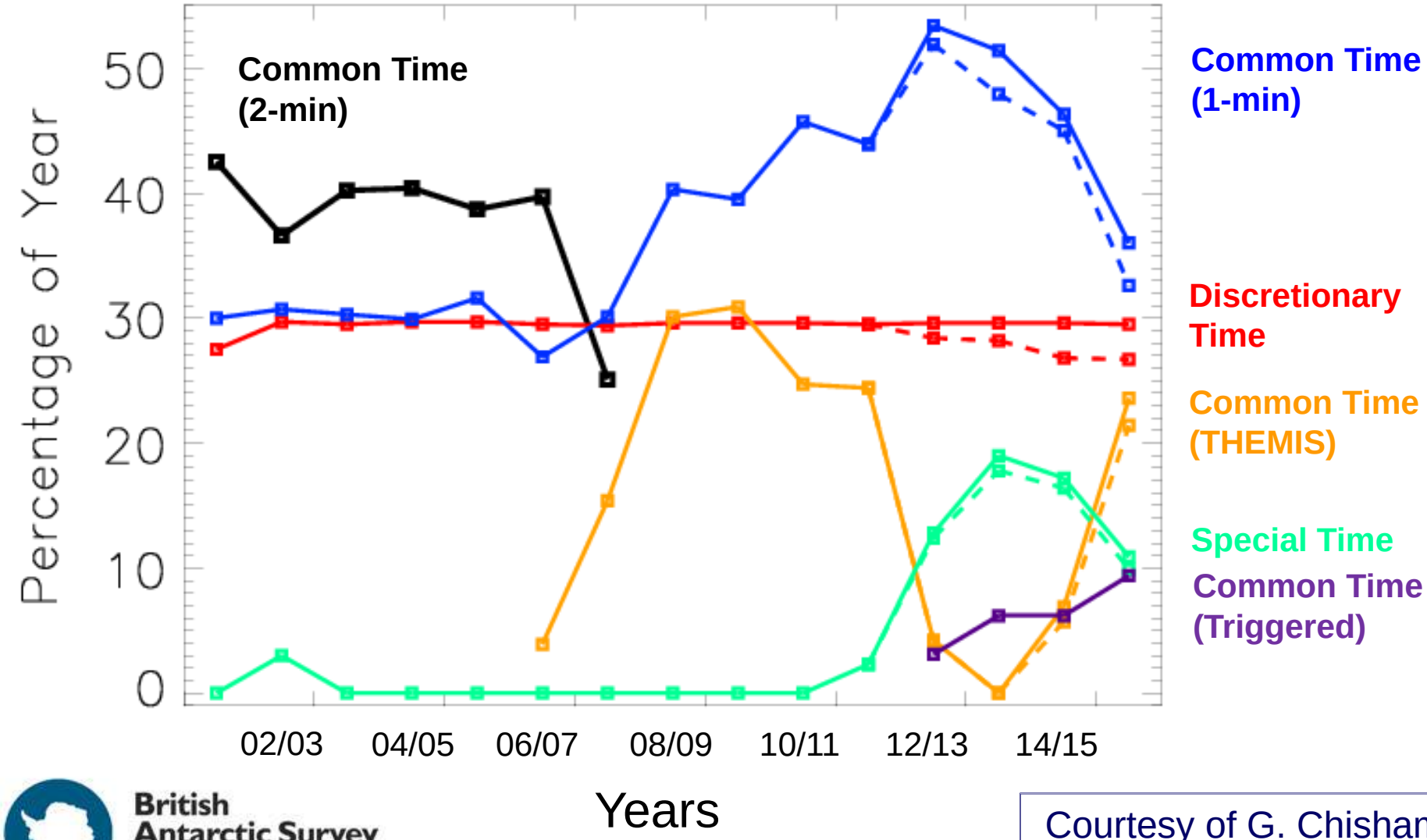
SuperDARN Time Usage 2014/15



British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Courtesy of G. Chisham
SD2016 Workshop

SuperDARN Time Usage
Yearly (June – May) Variation

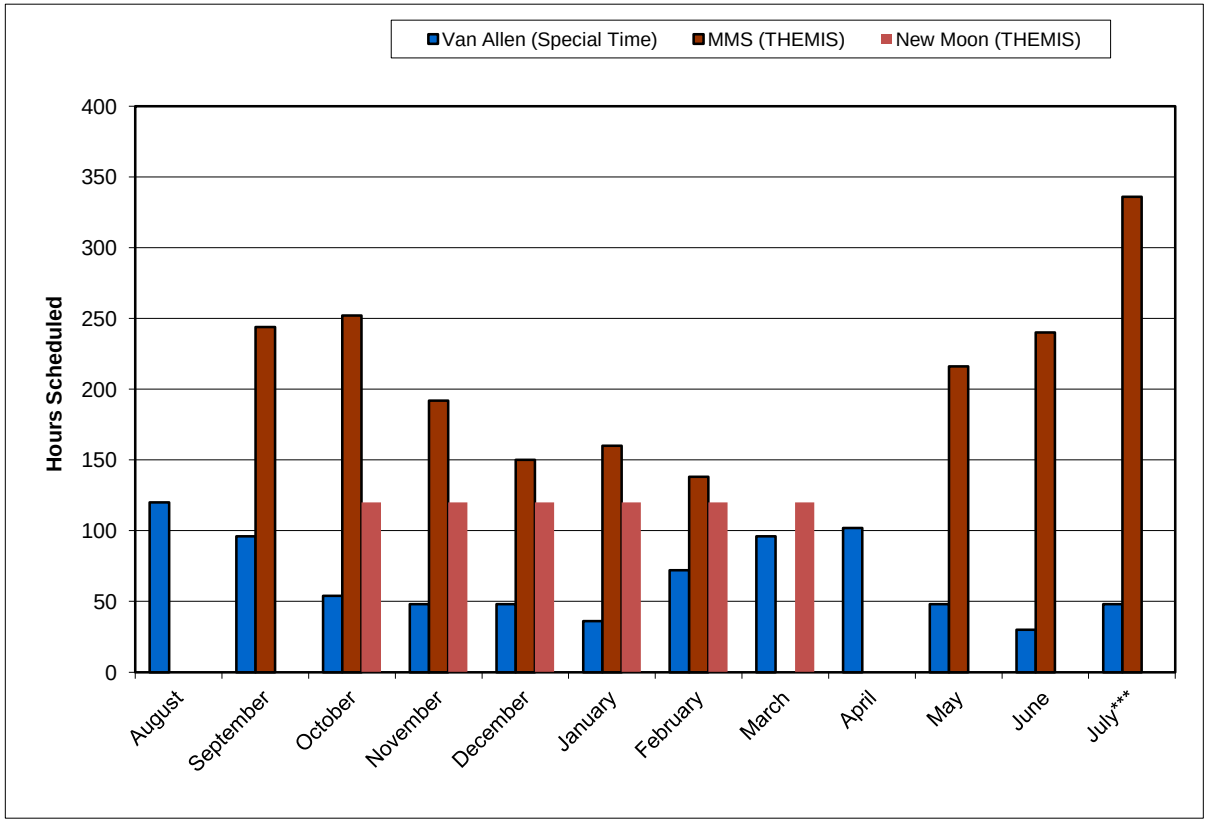


British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Courtesy of G. Chisham
SD2016 Workshop

Hours Schedule 2015-6

- Decrease for Van Allen
- Start of MMS; overlaps with new moon requests
- New moon period still through northern winter (equinox to equinox)

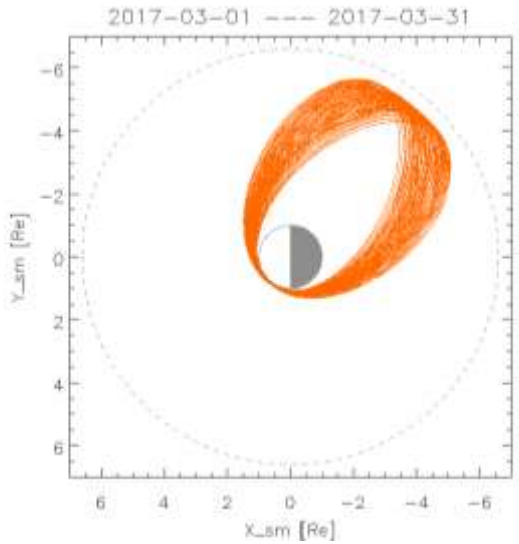


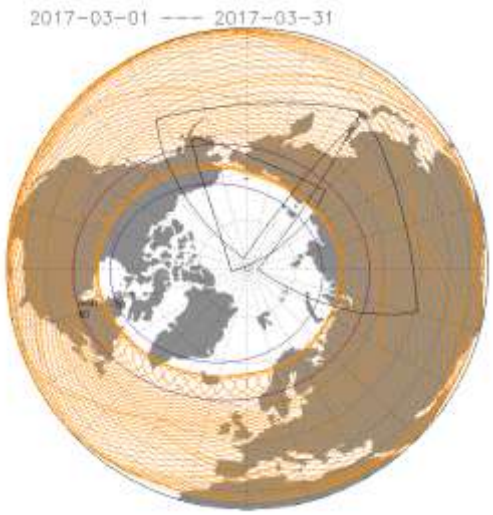
Courtesy of M. Ruohoniemi
SD2016 Workshop

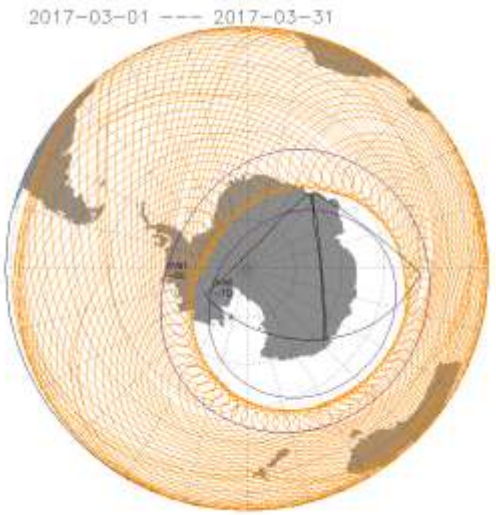
ERG orbit and footprint

Courtesy of M. Ruohoniemi
SD2016 Workshop

- Typical 1 day orbit & footprint
- Japanese team has been discussing the campaign observations and observation modes to optimize the collaboration between SD and ERG

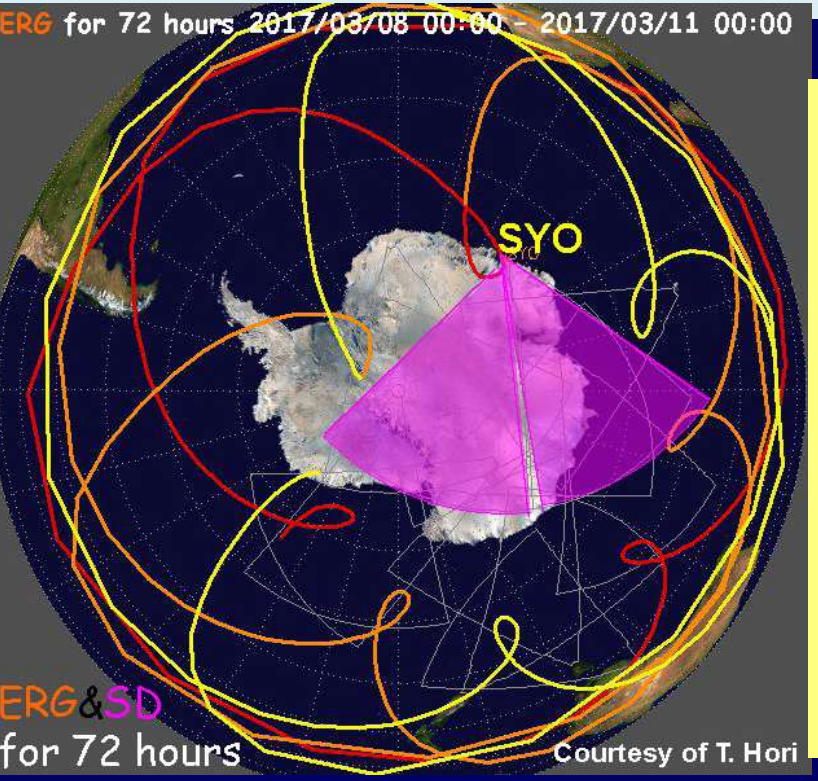






* These are based on one of the candidate launch dates. The orbit/footprint becomes definitive after the actual launch.

ERG & VAP footprints under SD FOVs and PC5 monitoring, SC events

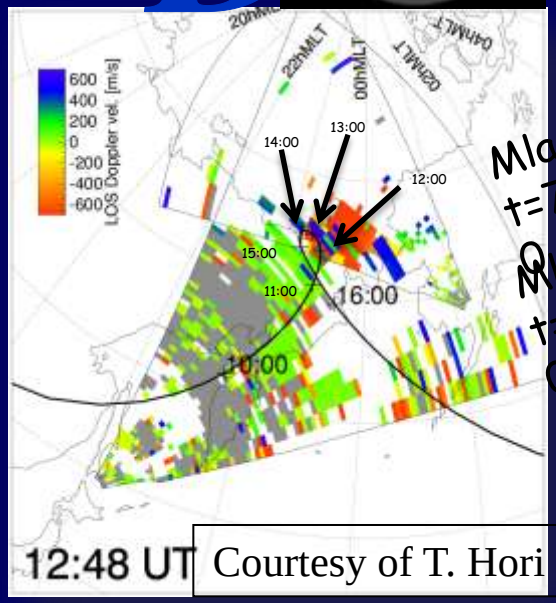


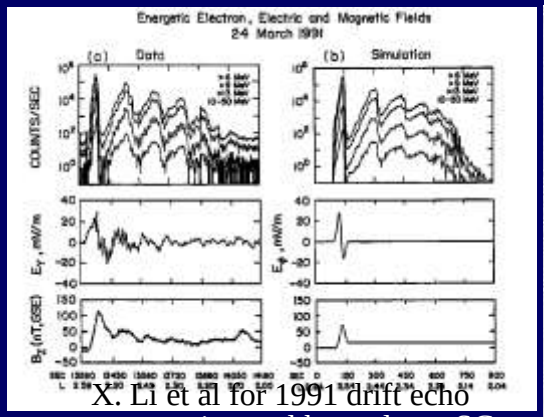
SD-ERG collaboration

Global E & Pc5 monitoring – particle accelaration mechanisms

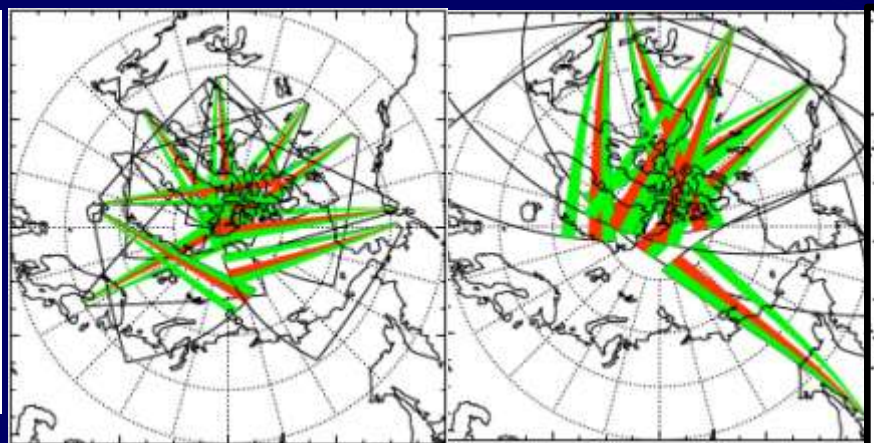
Special mode for conjugate obs.

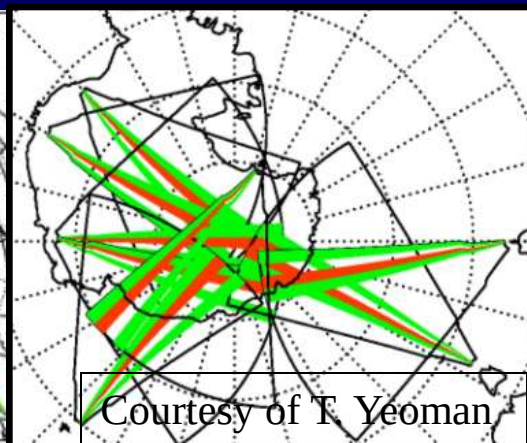
Global E at SCs …





X. Li et al for 1991 drift echo events triggered by an large SC





Near-term Future

- Continued support of Van Allen probes, MMS, ePOP(when requested and for how long)
- Discuss ERG support mode, request periods, timing
- Look for upcoming support/coordination with CARINA (Bernhardt/NRL)
- Update spacecraft related publication list:

  http://vt.superdarn.org/tiki-index.php?page=Spacecraft+Working+Group

Courtesy of M. Ruohoniemi
SD2016 Workshop

Main task – FITACF3.0

fitacf.2.6 – Re-factored FITACF2.5 (improved code transparency and functionality); generates the same results as FITACF2.5

fitacf.2.7 – FITACF2.6 with implemented Tasks #1, #2, and #3 which produce more realistic error estimates.

fitacf.3.0 – Fully re-written package that follows good coding practices and implements optimal processing algorithms. Exhaustively tested against simulated data but requires more independent testing against real data. For more detail, see our presentation this afternoon.

Courtesy of P. Ponomarenko
SD2016 Workshop

Two main revisions

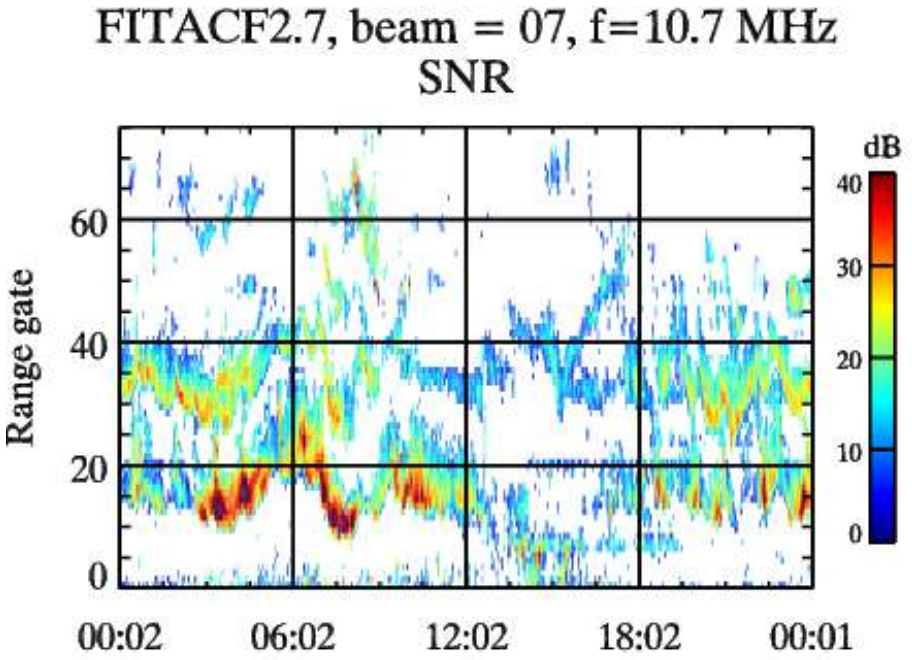
2004-2005

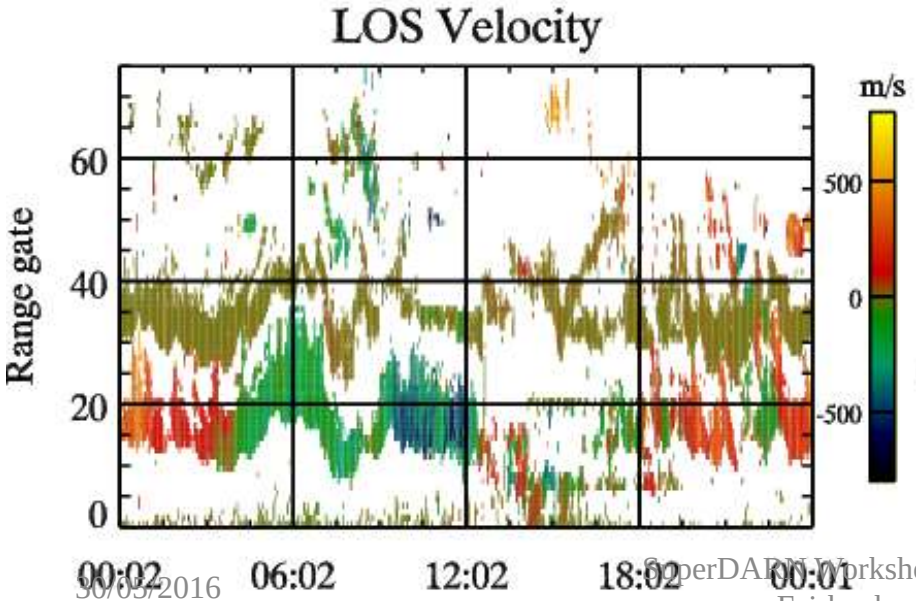
- **Main issue**: too large spectral width values
- **Main findings**:
  - Incorrect treatment of statistical fluctuations
  - Too liberal threshold for cross-range interference
  - Some other issues (*more_badlags*, noise ACF, etc)
- **Result:** FITACF2.0 – most width-related issues were fixed, but the package's structure remained untouched

2012-2013:

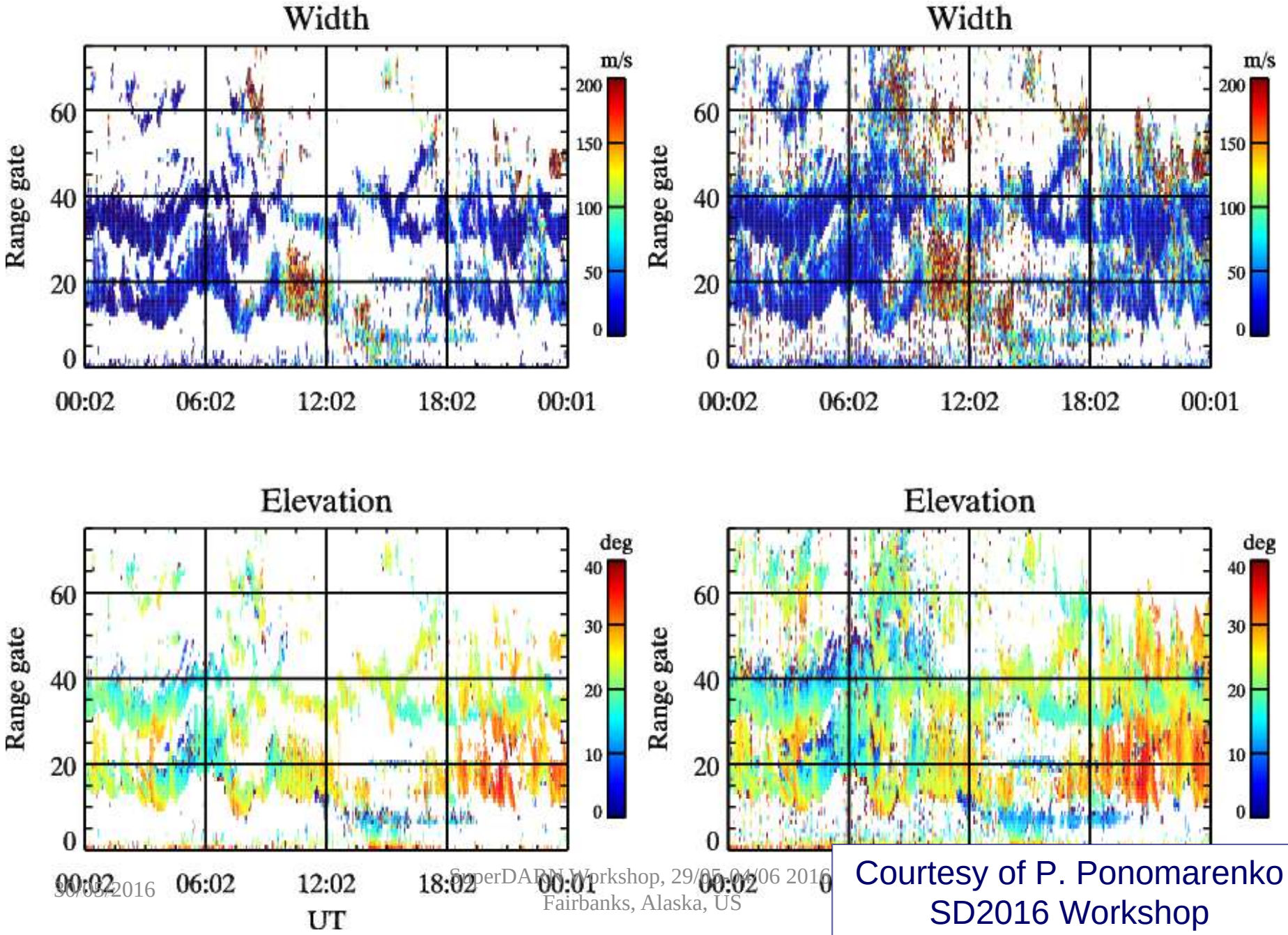
- **Main issue**: meaningless velocity error values
- **Main findings**:
  - Coding errors in error calculations
  - **Non-optimal implementation of the Least Squares fitting:**
    - **Incorrect weighting coefficients for both phase and power**
    - **Use of CRI level for lag rejection rather than for weighting fitted data**
  - In order to implement the above changes, it is necessary to re-structure the package
- **Result**: FTACF3.0 (See below!)

Courtesy of P. Ponomarenko
SD2016 Workshop



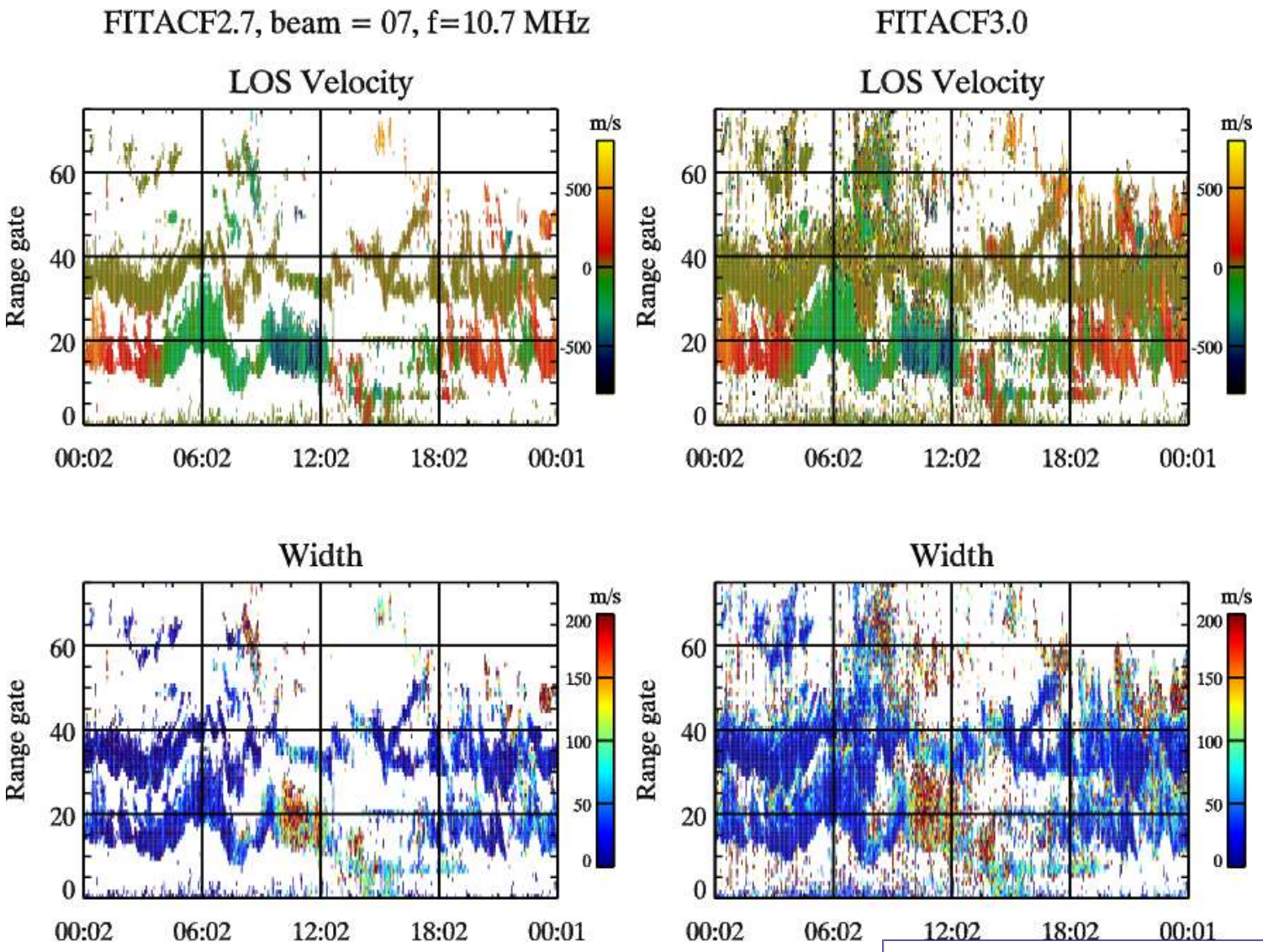


Courtesy of P. Ponomarenko
SD2016 Workshop



Courtesy of P. Ponomarenko
SD2016 Workshop

Errors



Courtesy of P. Ponomarenko
SD2016 Workshop

Other topics or issues

- Interferometer calibration – 2 freq operation, geolocation, ...

- AACGM-v2 (and MLT).
- FitACF v3.0
- RST and Map potential updates...

- E field correction – 2 freq operation etc.

Data distribution

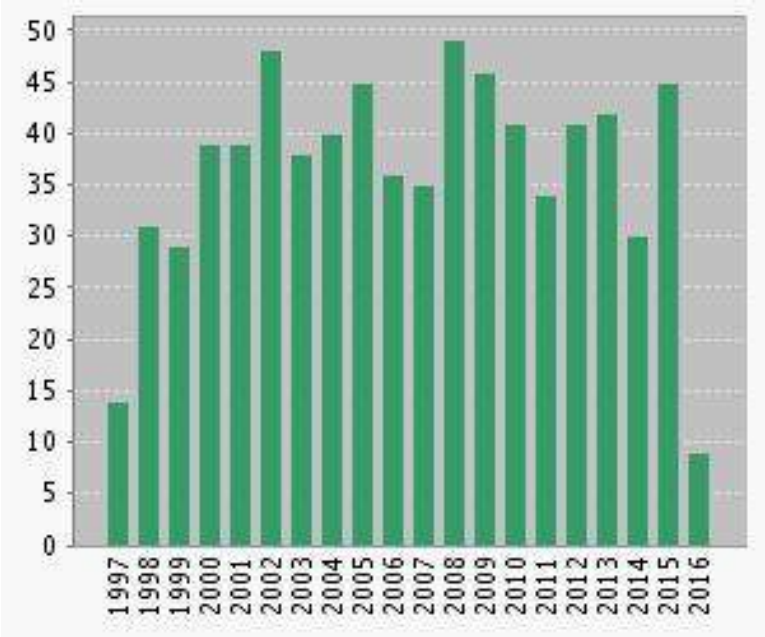
Courtesy of M. Lester
SD2016 Workshop

- **Data Hub:** UoS and BAS together with VT have made some good progress on the data hub but in the last few months there have been some technical issues at Saskatoon while a lack of available staff at BAS has held things up there
- Currently a large number of radars run by PIs in Europe, Asia, Africa and Australia submit their data via BAS although still waiting to complete the full list due to availability of staff effort
- The American and Canadian radars submit to VT and then onto the hub at UoS
- At UoS the Hub worked well until mid-March when technical issues started which have meant that no data have been transferred since then due to line speed issues. Upgrades will be in place by the end of the year. There remains a question about what we do in the meantime.

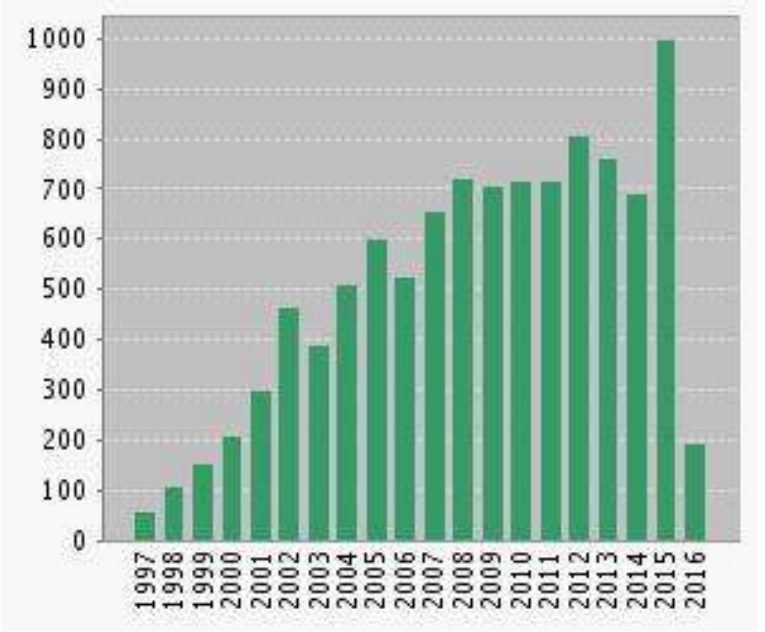
UNIVERSITY OF LEICESTER

SuperDARN Citation Statistics

No of Papers 1997 - 2016



No of Citations1997 - 2016



Refined by: WEB OF SCIENCE TOPIC (SuperDARN OR CUTLASS OR TIGER HF Radars) and CATEGORIES: (ASTRONOMY ASTROPHYSICS OR GEOSCIENCES MULTIDISCIPLINARY OR METEOROLOGY ATMOSPHERIC SCIENCES OR GEOCHEMISTRY GEOPHYSICS OR ENGINEERING AEROSPACE)

Courtesy of M. Lester
SD2016 Workshop

UNIVERSITY OF LEICESTER

SuperDARN JAPAN

What's SuperDARN?

SuperDARN (Super Dual Auroral Radar Network) is an international collaboration project by eleven countries in the world. As of 01 January 2015, SuperDARN consists of twenty-two sites in the northern hemisphere and twelve sites in the southern hemisphere, covering over the northern and southern high- and mid-latitude regions. Among them, Five radars have been operated by Japanese groups (2 in Syowa Station by National Institute of Polar Research, 1 in King

What's New

Dec. 16, 2015
SuperDARN JAPAN website is under construction.

Sep. 14-15, 2015
Workshop of three agencies organized was held at Nagoya University.

Newest Plots
Syowa SENSU Summary
SENSU Daily Plot
File Search
Map

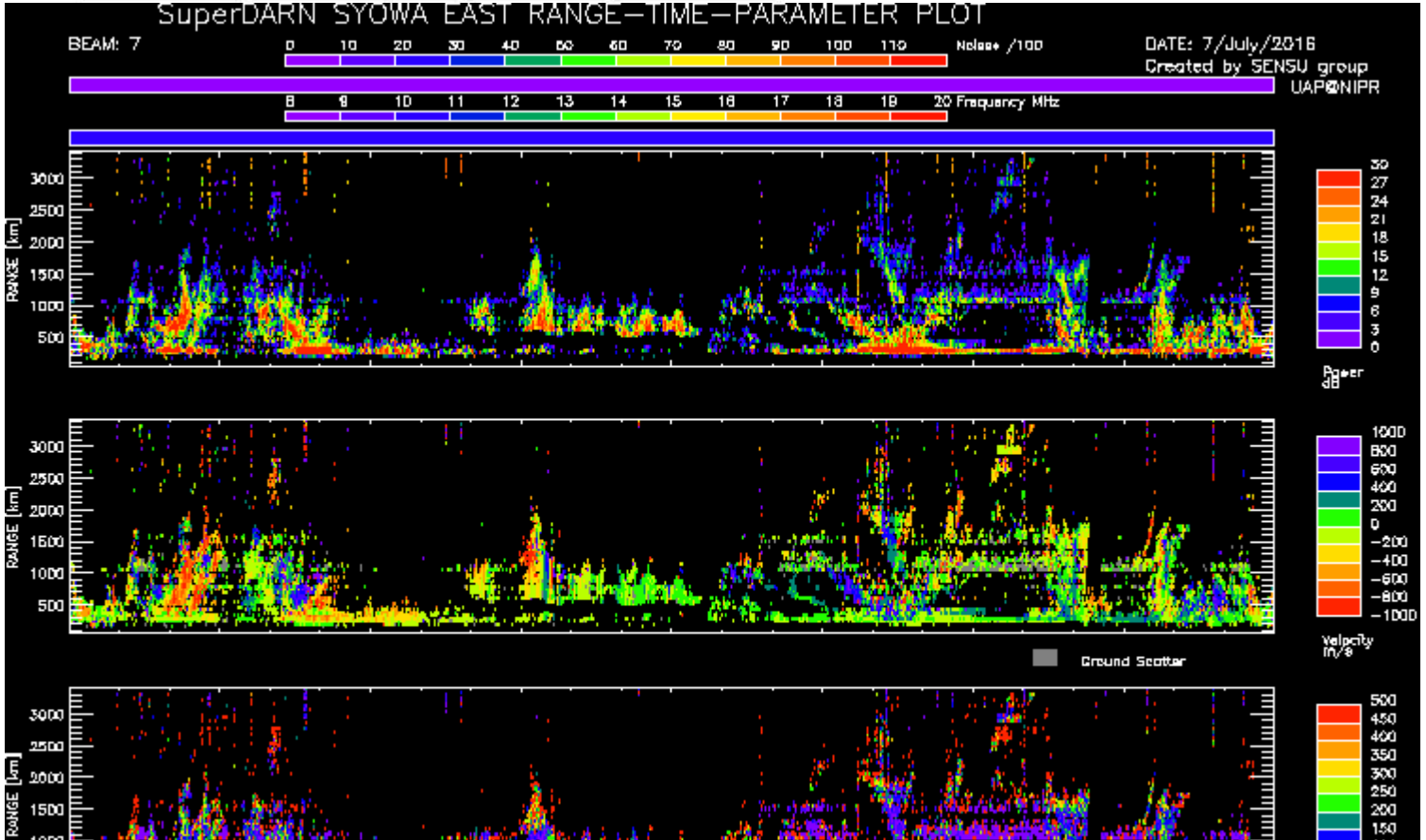
SENSU Summary Plot

test for SENSU summary of webold (monthly & daily)

Monthly Calender | Monthly SmrPlot | Daily Plot

Radar	Year	Month	Day
Syowa East	2016	7	7

< Prev Month | < Prev Day | Plot | Next Day > | Next Month >




終
The End