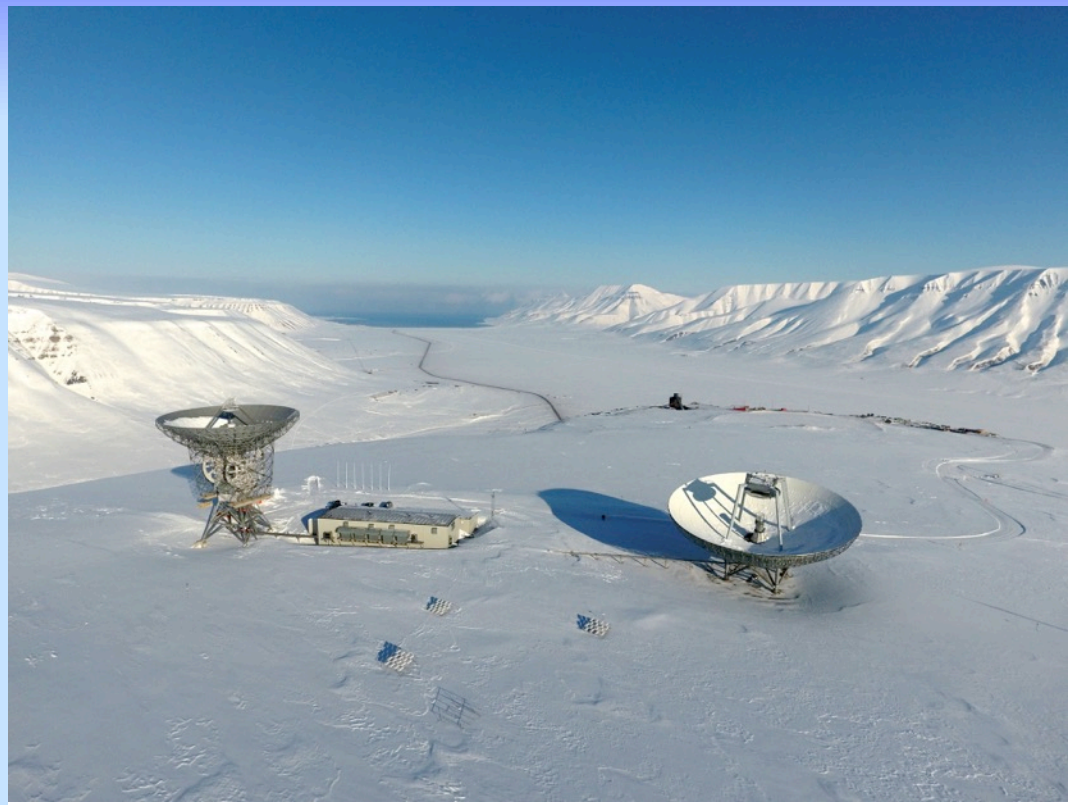
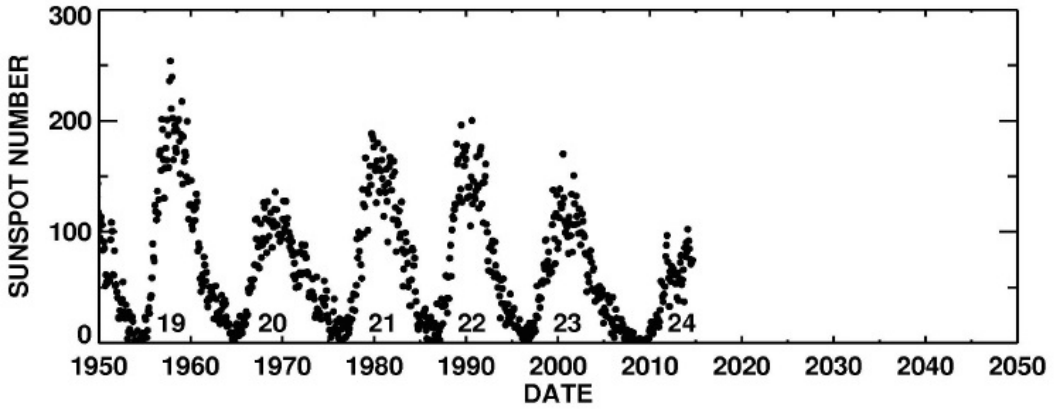
European Incoherent SCATter Radars (EISCAT)

Craig Heinselman
EISCAT Scientific Association

EISCAT Scientific Association

- Founded in 1975, first operations 1981, first Svalbard operations 1996
- "The aim of the Association is to provide access to radar, and other, high-latitude facilities of the highest technical standard for non-military scientific purposes".
- Locations: Tromsø (NO), Sodankylä (FI), Kiruna (SE), Longyearbyen (Svalbard).
- Founding members: UK, DE, FR, NO, SE, FI.
- Members (2016): UK, NO, SE, FI, JP, CN (RU, FR, UA, KO).
- August 2011: 30 years of measurements.
- More than 2100 publications



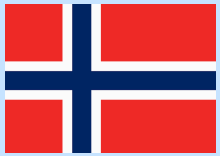


EISCAT Scientific Association

CRIRP, PRC

Suomen Akatemia, Finland*

NIPR/ISEE, Japan



Forskningsrådet, Norway*

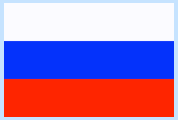
Vetenskapsrådet, Sweden*

NERC, U.K.

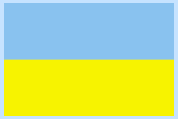
Associates

* EISCAT host countries

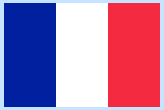
Affiliates



AARI, Russia



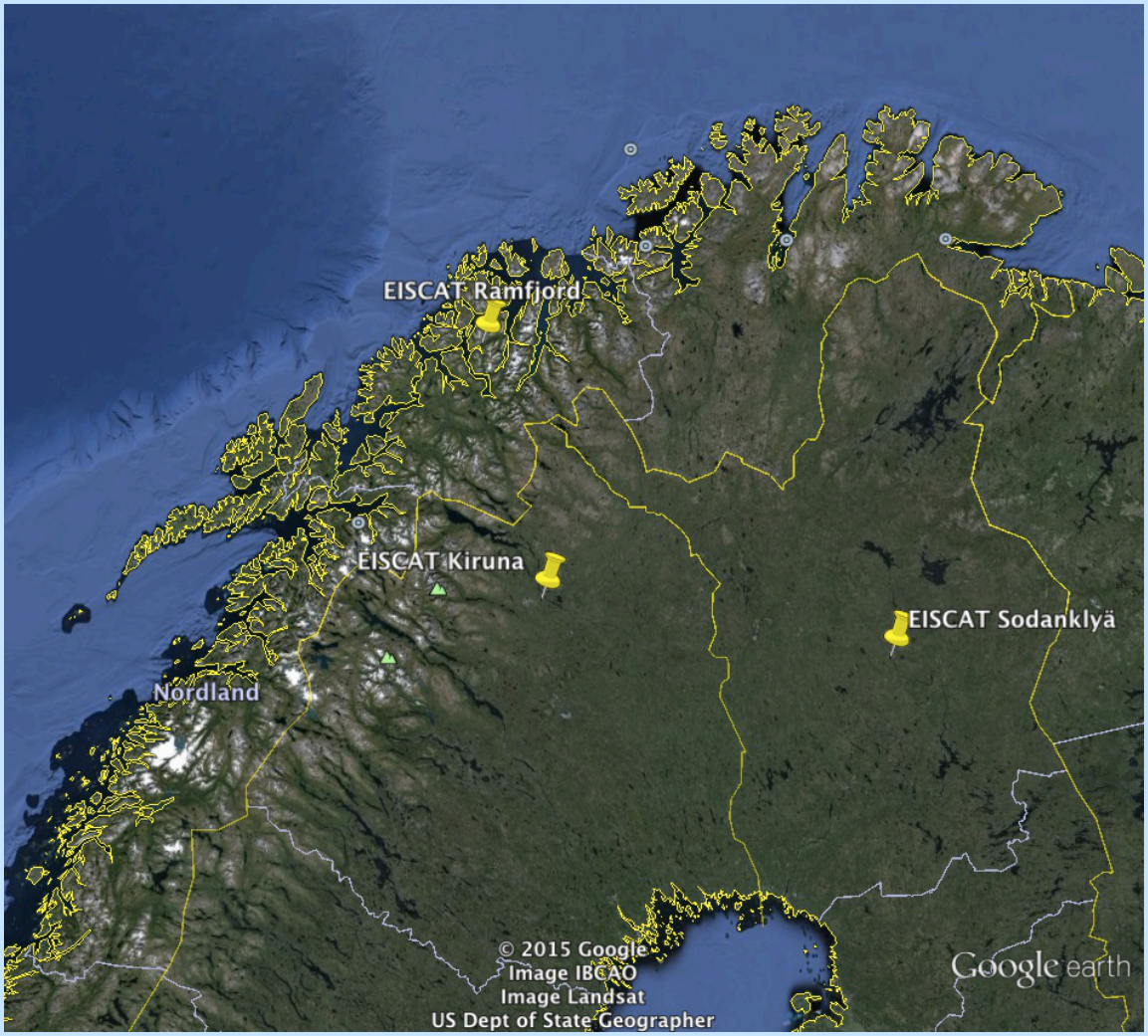
IRA, Ukraine



IRAP, France

KOPRI & KASI, S. Korea

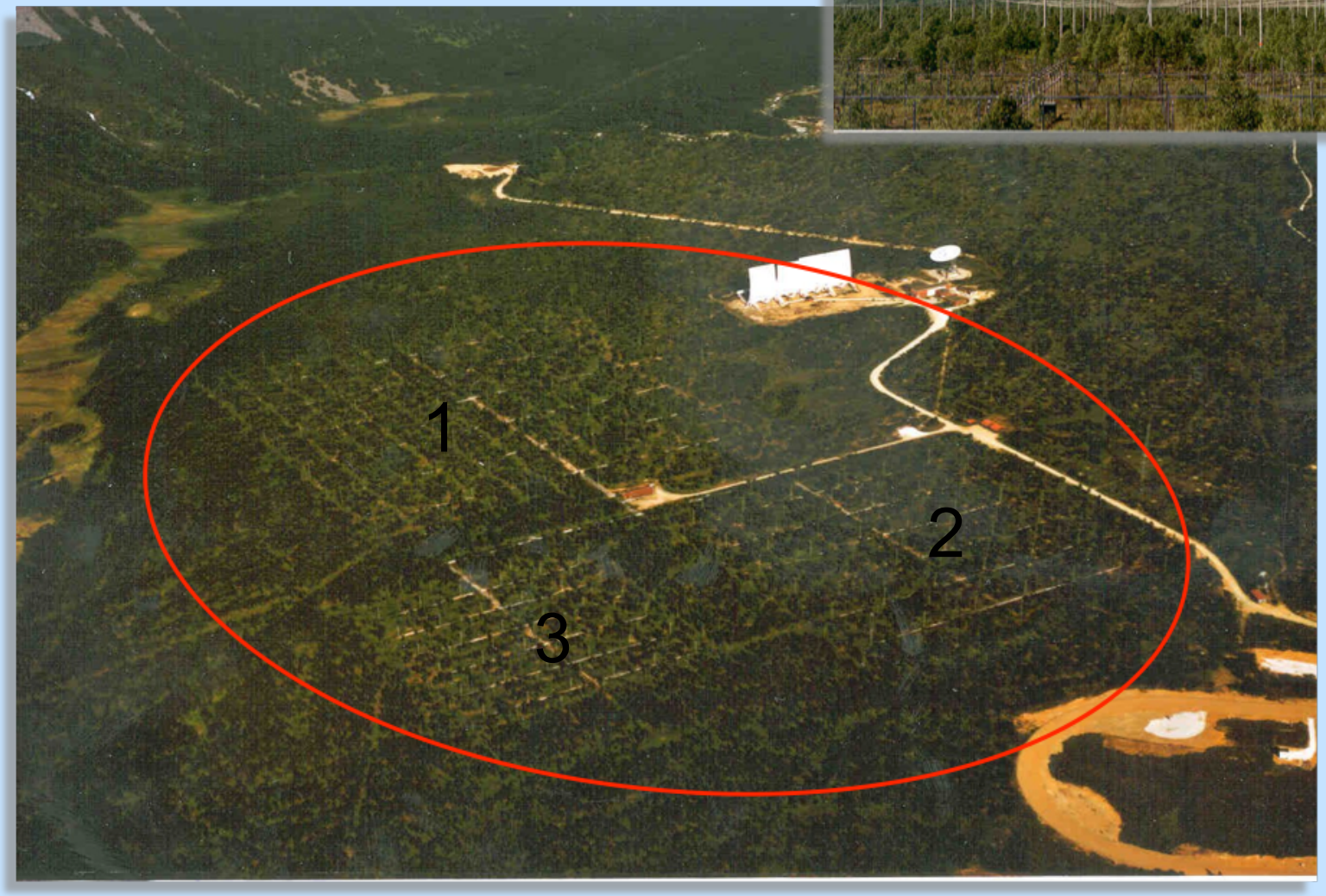
EISCAT Mainland



Tromsø VHF and UHF

Tromsø Heating

Ionospheric Heater 4-8 MHz



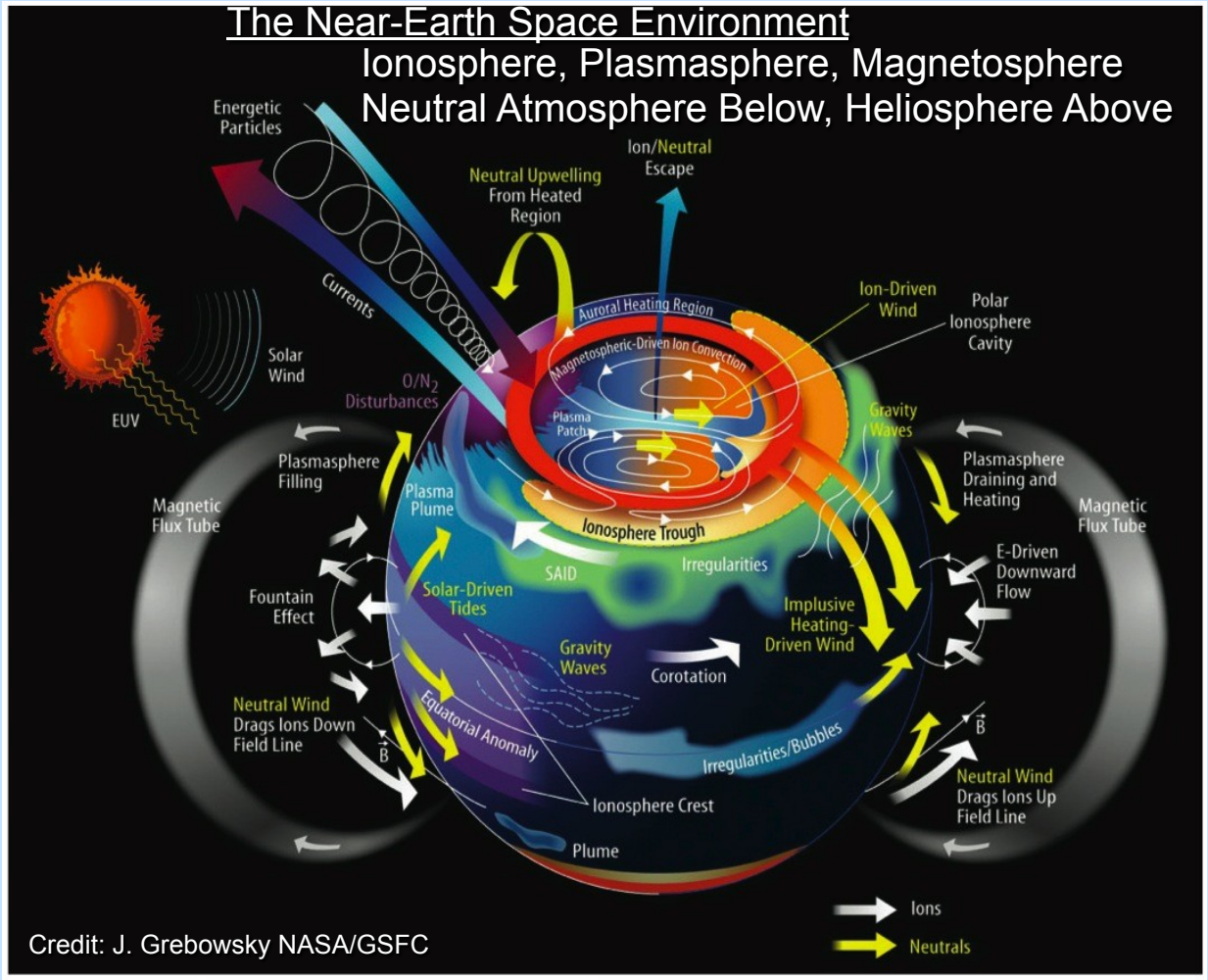
Kiruna, Sodankylä Receive-only

EISCAT Svalbard Radar, Longyearbyen

EISCAT Science

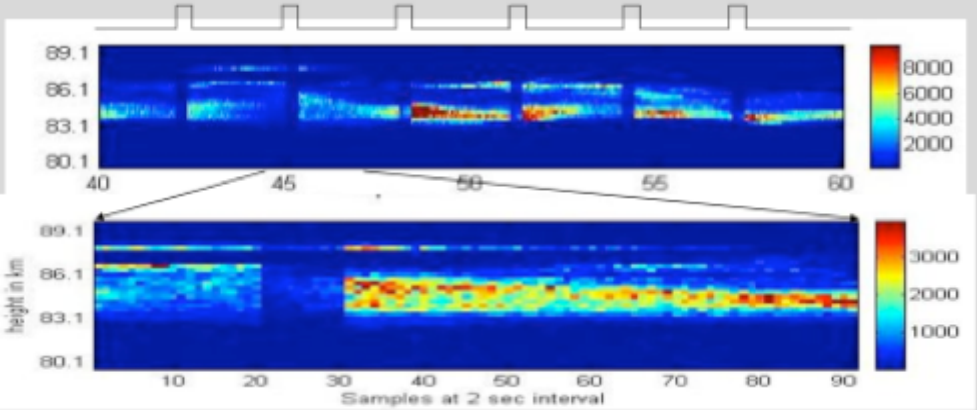
How is Earth's atmosphere coupled to geospace?

- Auroral electrodynamics
- Ionospheric plasma structuring
- Space weather effects
- Climate change
- Micrometeors
- Near-Earth object studies
- Basic plasma physics via active experiments



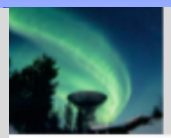
Other EISCAT Science

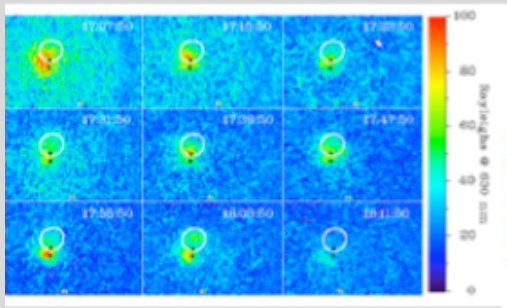
Modulation of Polar Mesospheric Summer Echoes

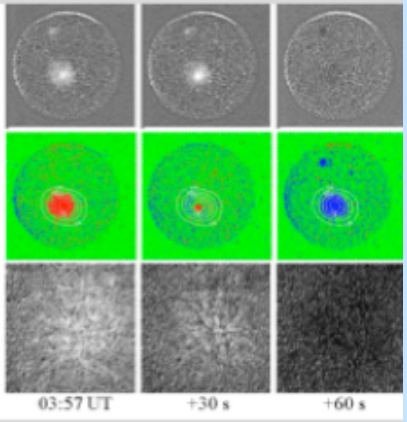


Overshoot effect – Lower dust density, or larger dust grains ??

Artificial Auroras

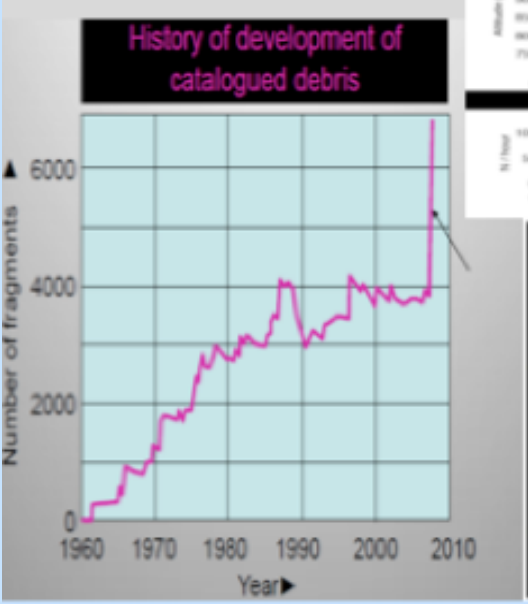


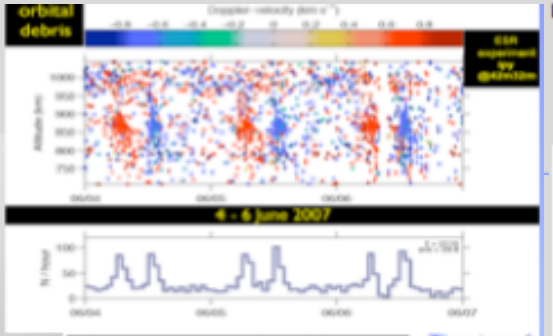


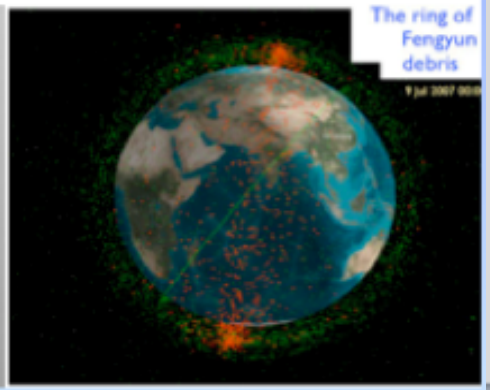


Images courtesy of Mike Kosch, University of Lancaster

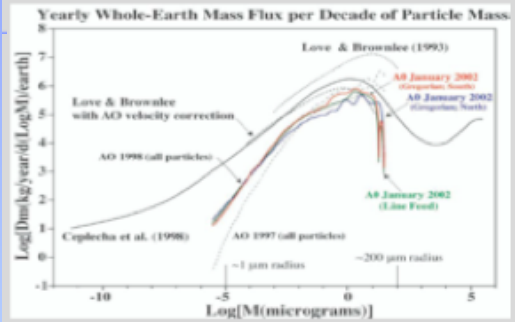
Space Debris

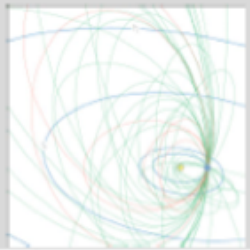


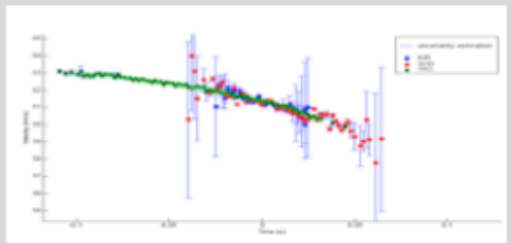


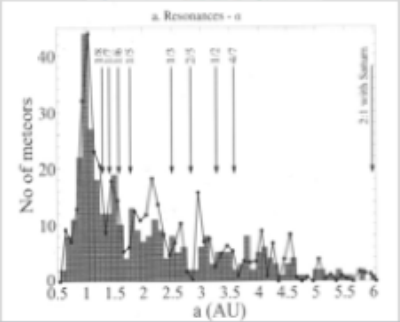


Meteors and Solar System Dust

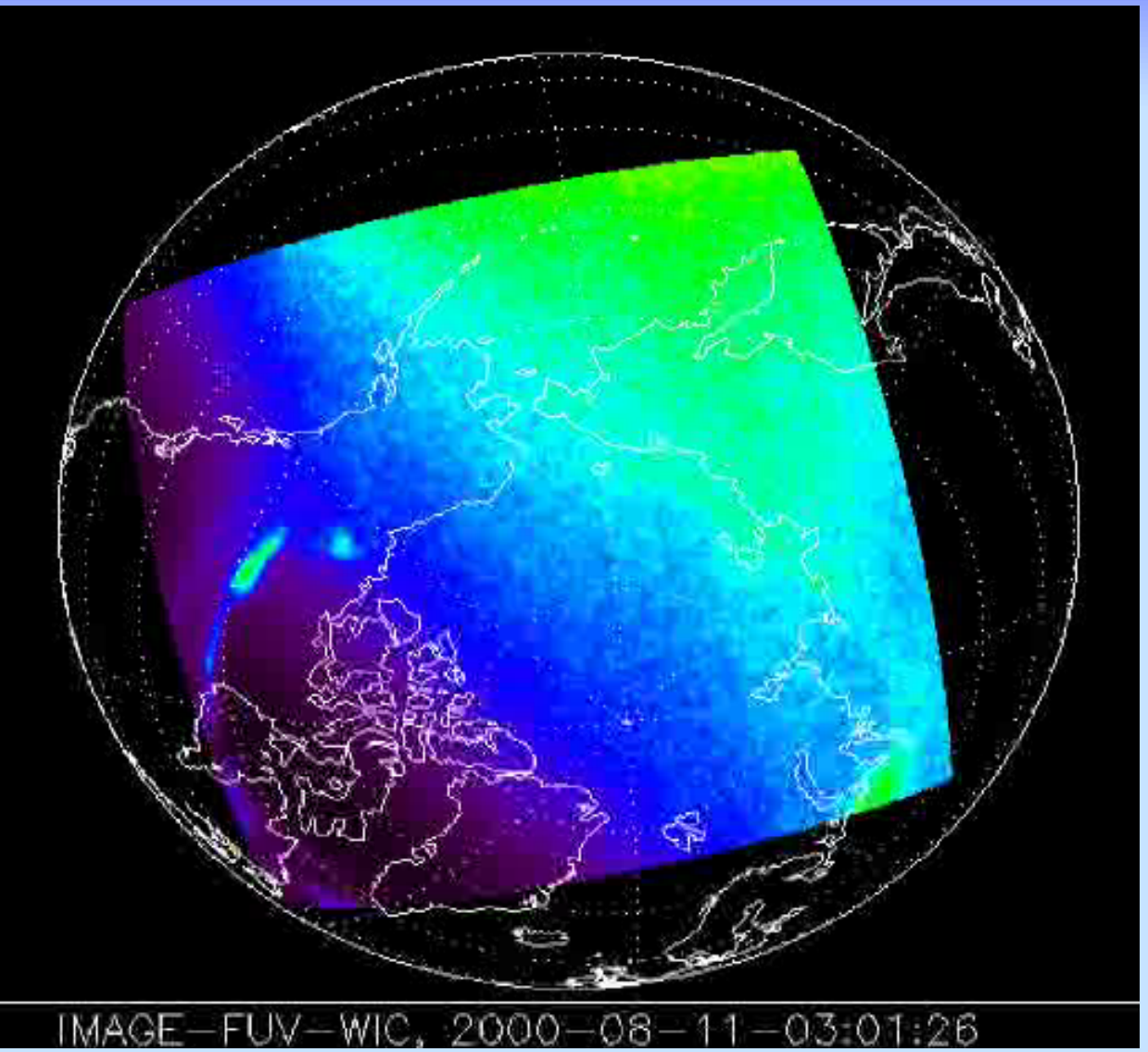


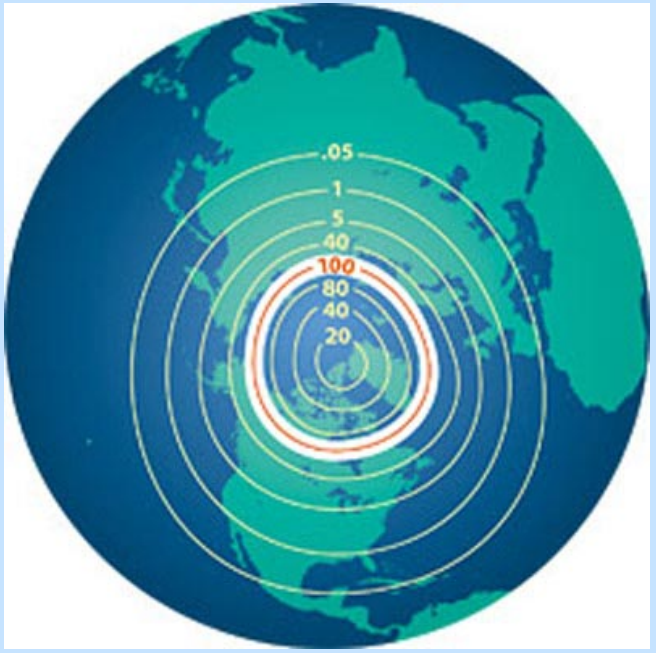






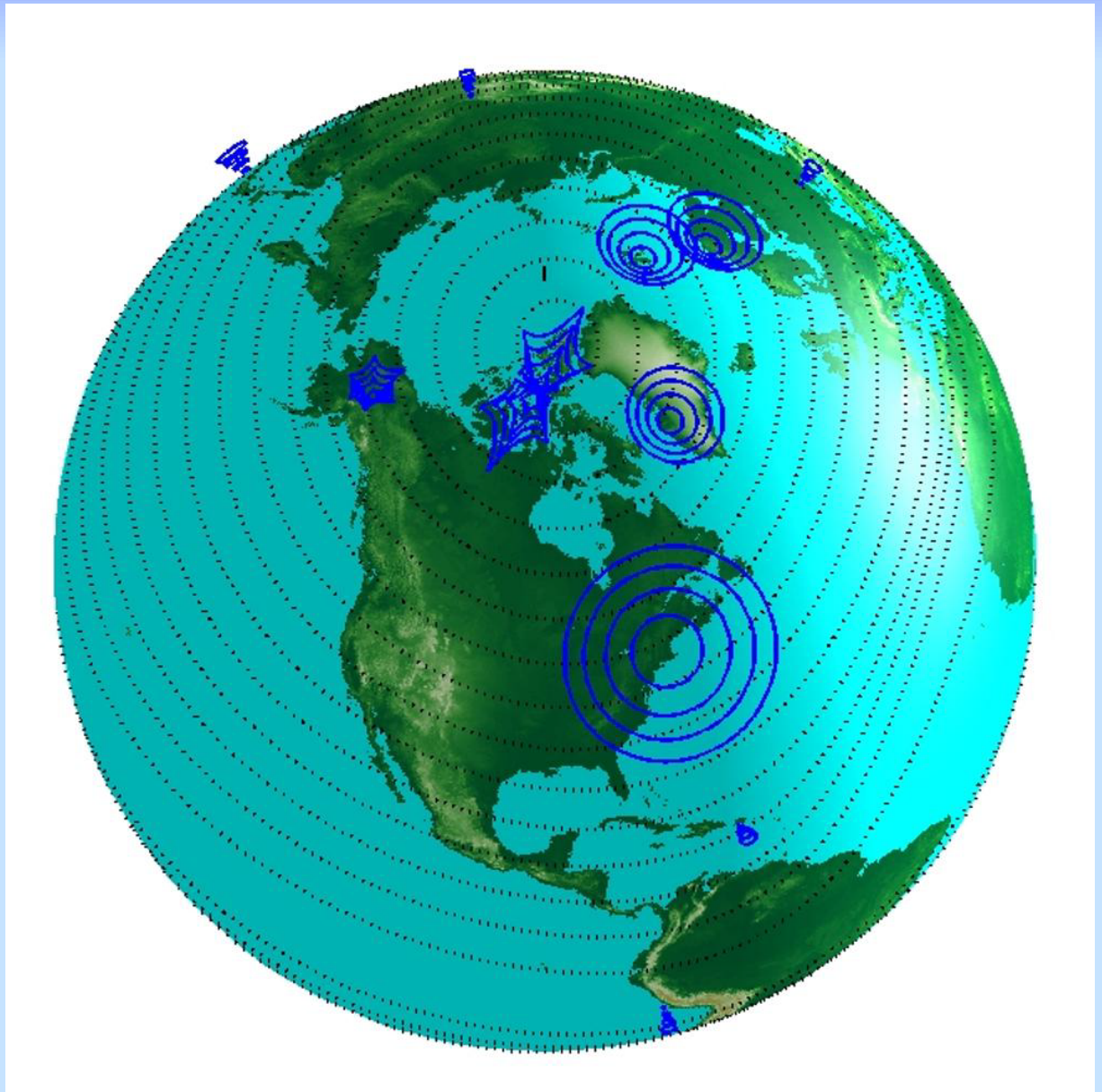
Why Here?



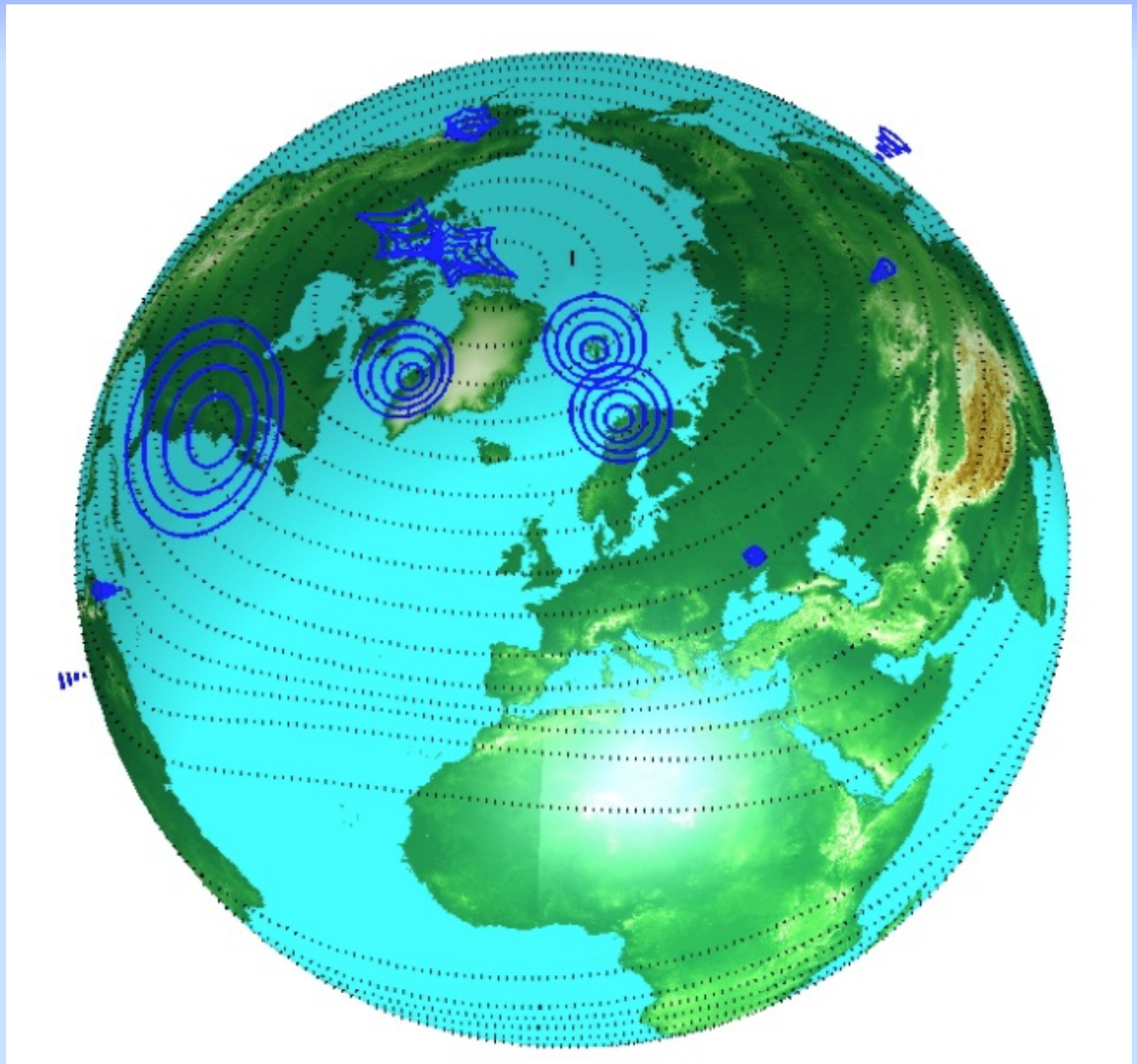


Percentage of nights with aurora (assumes clear skies)
Credit: Robert Eather

Global ISR Community

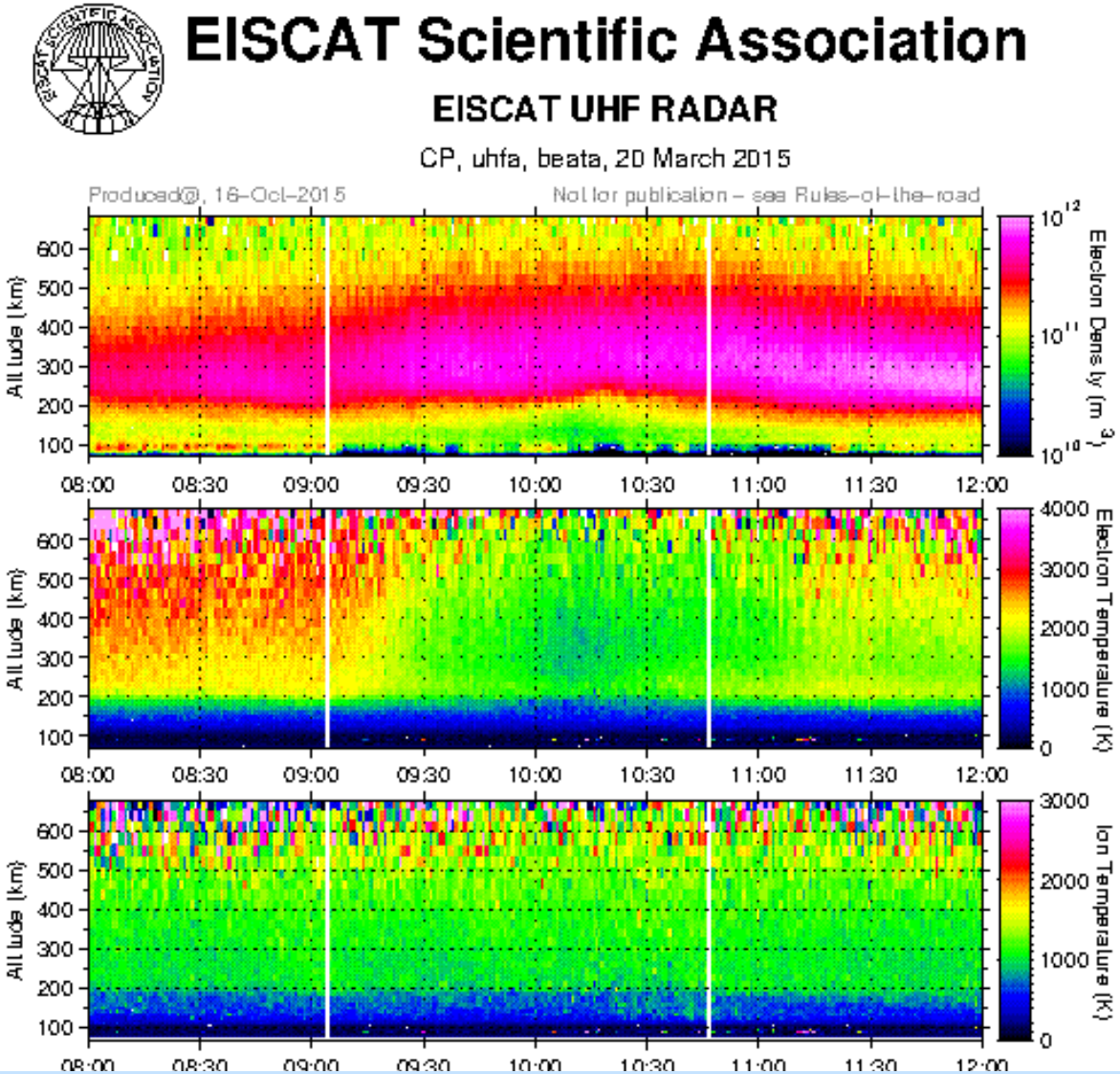


Global ISR Community



Solar Eclipse

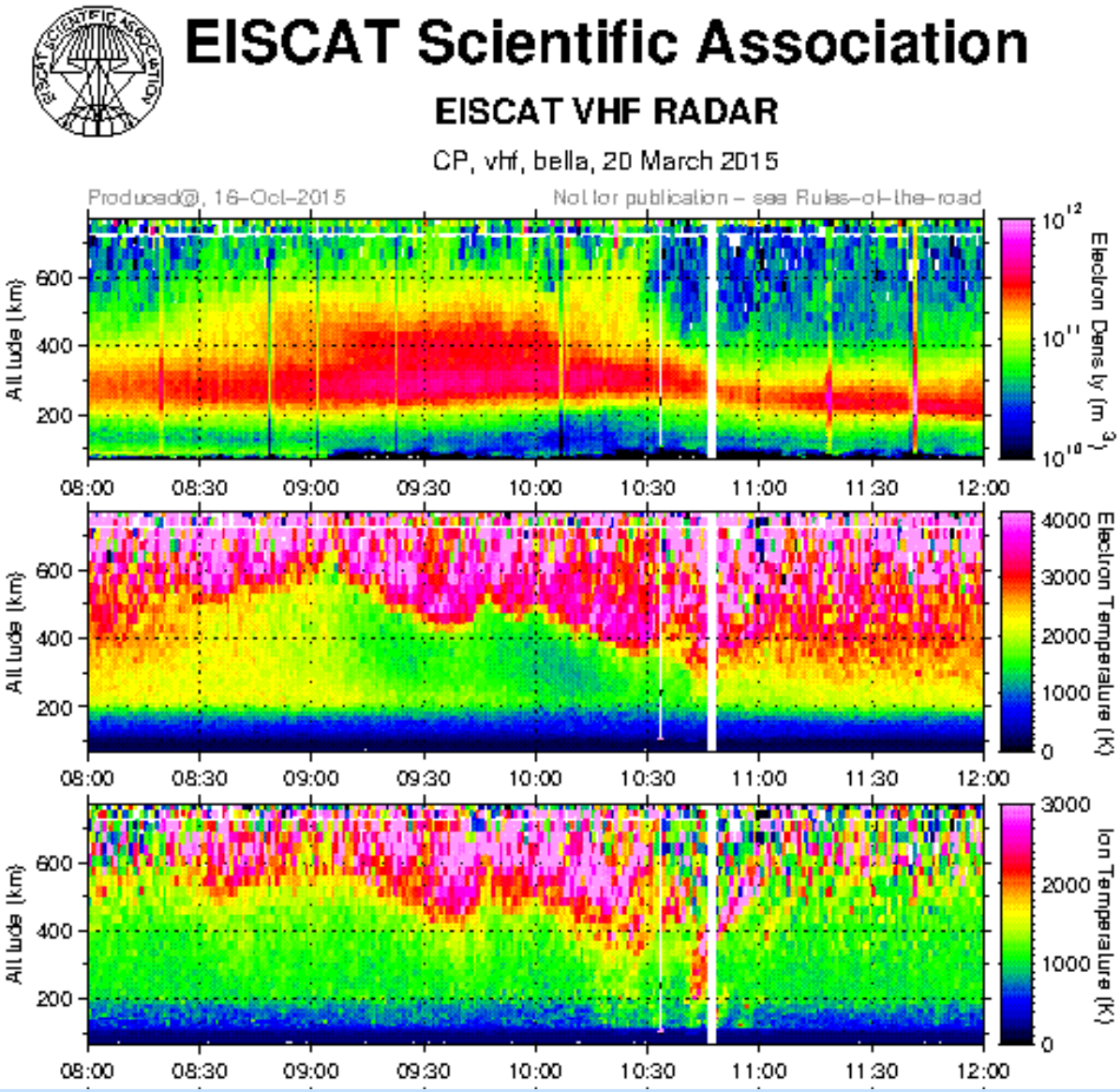
95%



9:04-10:08-11:13

Local Measurements

Solar Eclipse



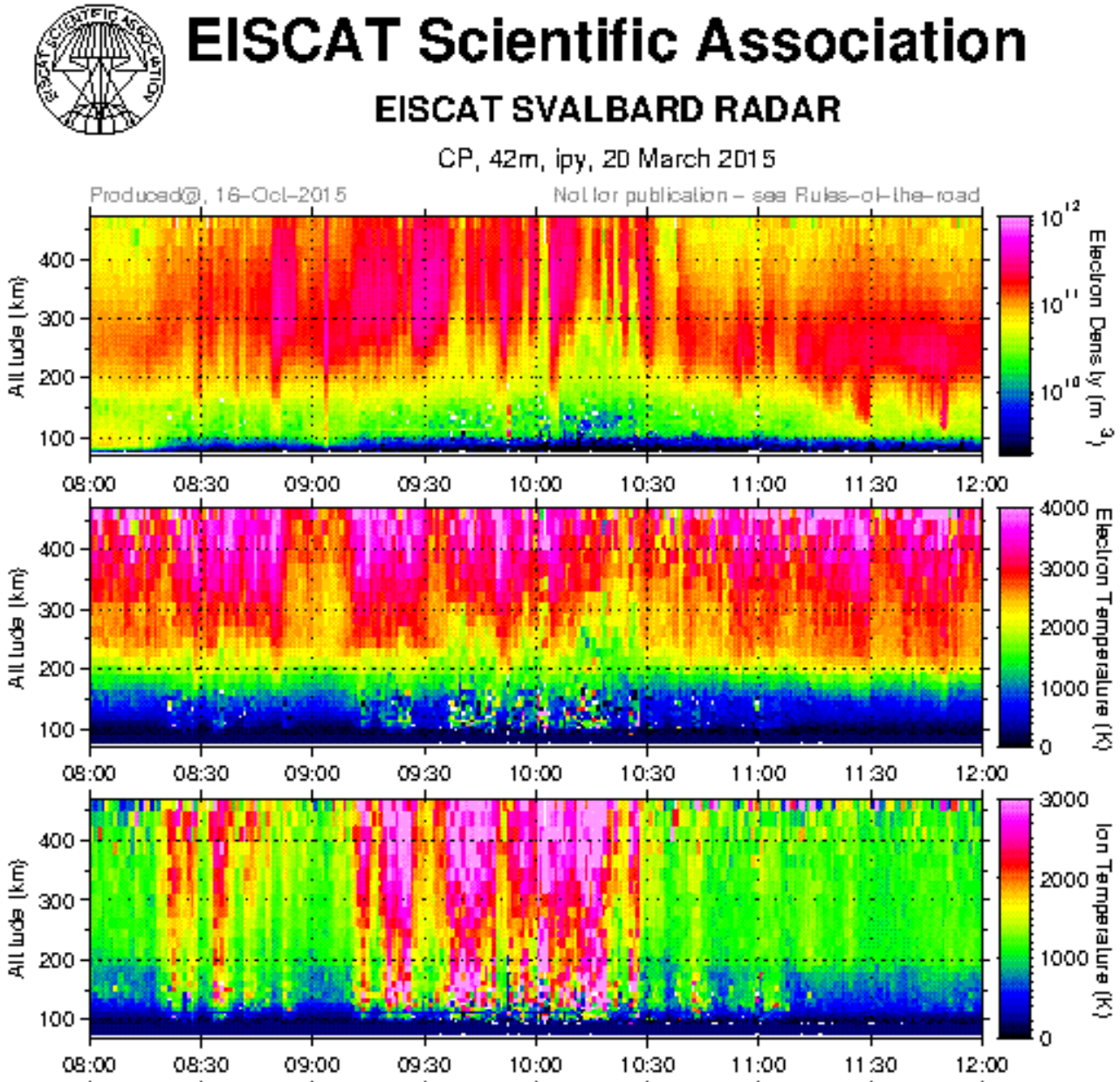
9:04-10:08-11:13

Looking Northward

Solar Eclipse

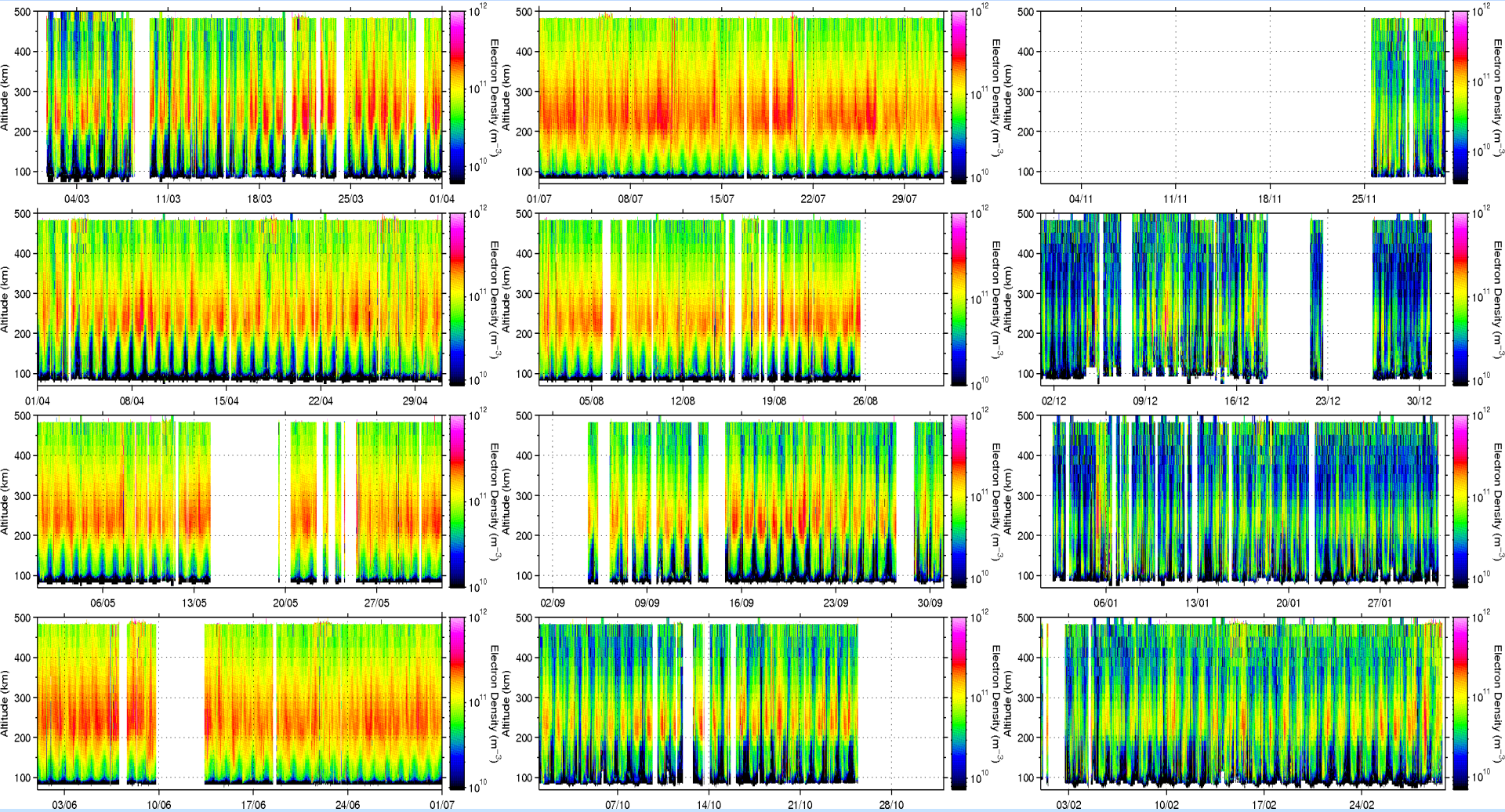
Photo by
Assar Westman

9:12-10:12-11:12

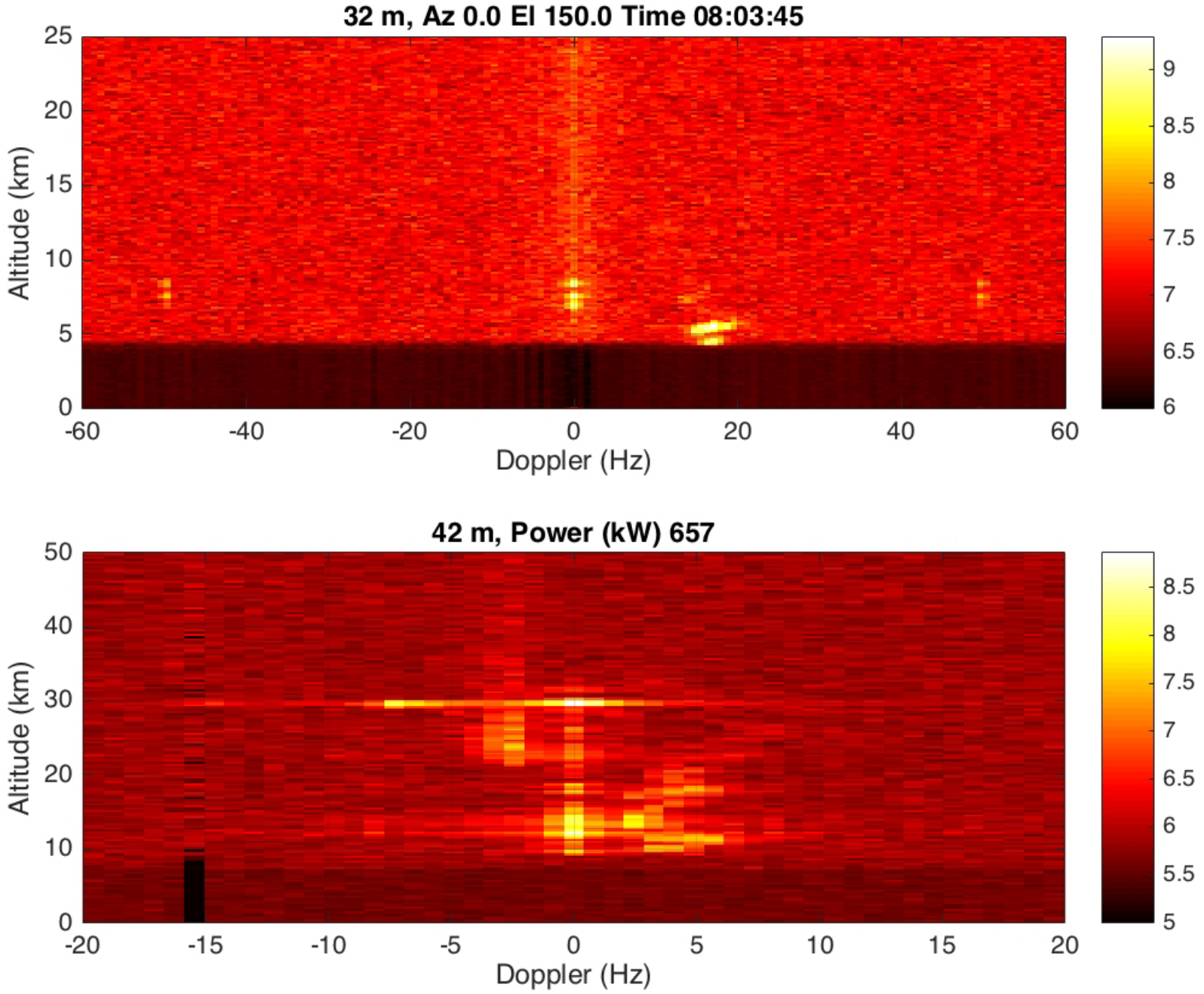


EISCAT Scientific Association

International Polar Year 2007/8



One year of ESR data!


32 m, Az 0.0 El 150.0 Time 08:03:45
Altitude (km)
Doppler (Hz)
42 m, Power (kW) 657
Altitude (km)
Doppler (Hz)

KTH Analysis of 8 Years of EISCAT Publications

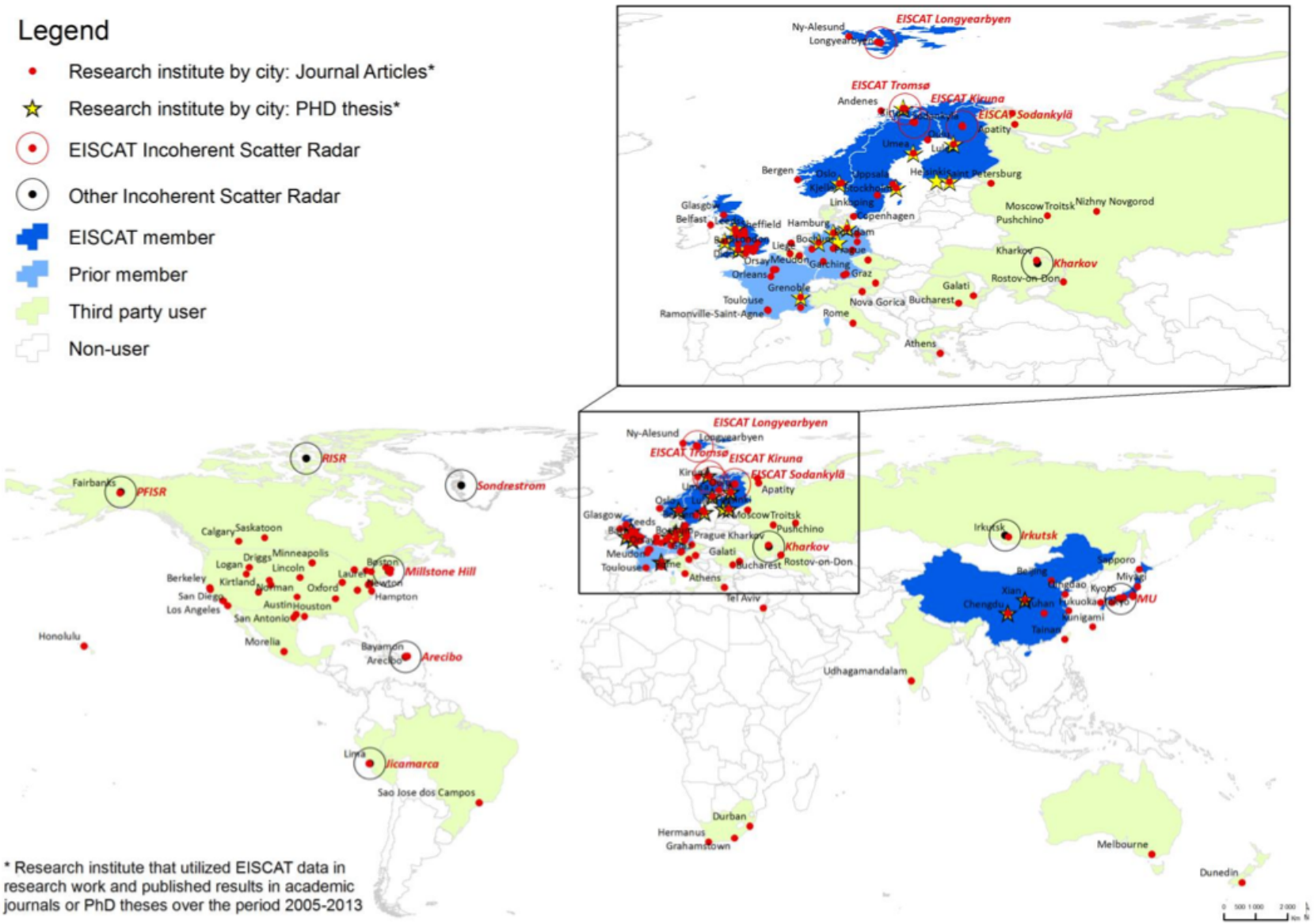
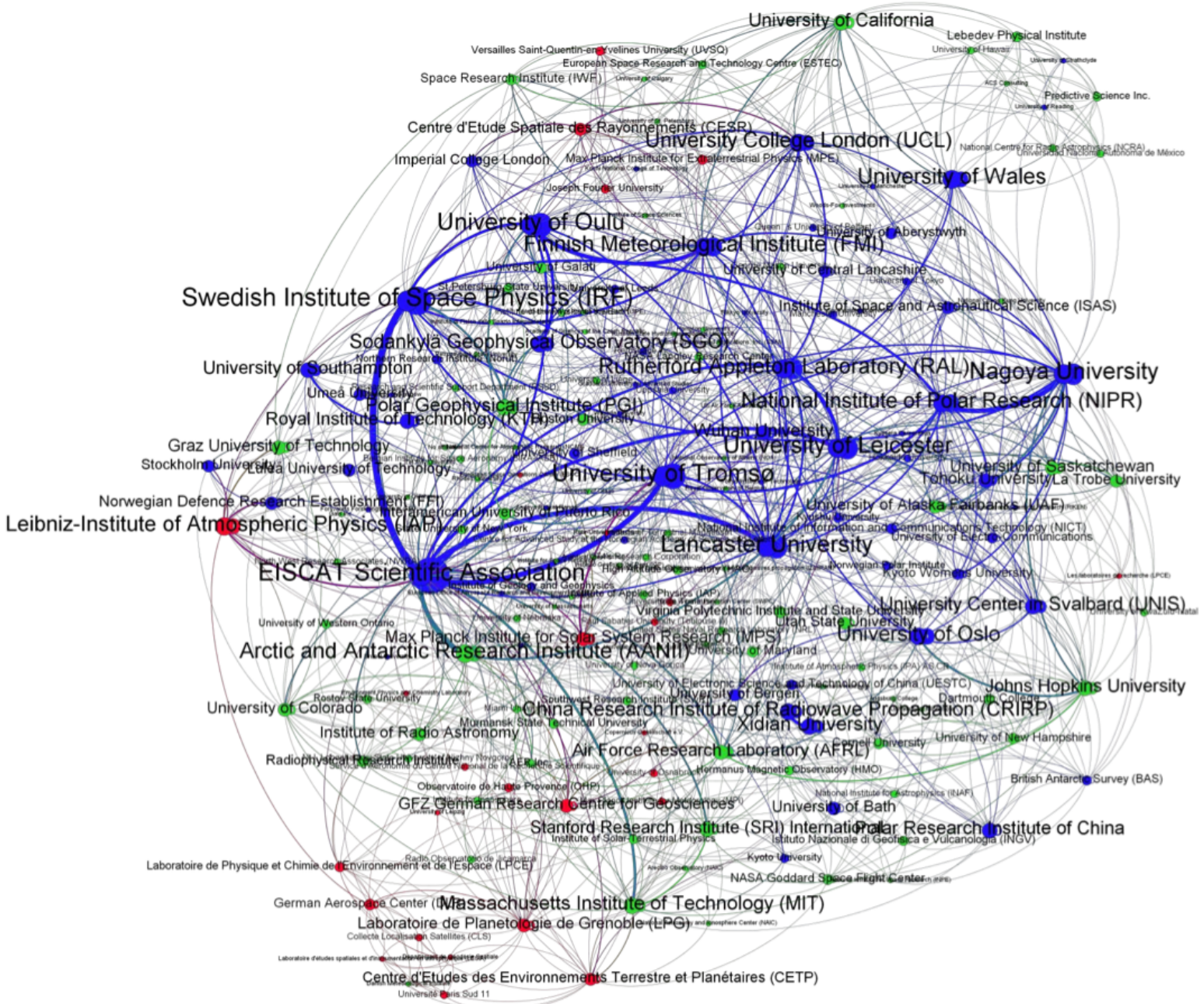
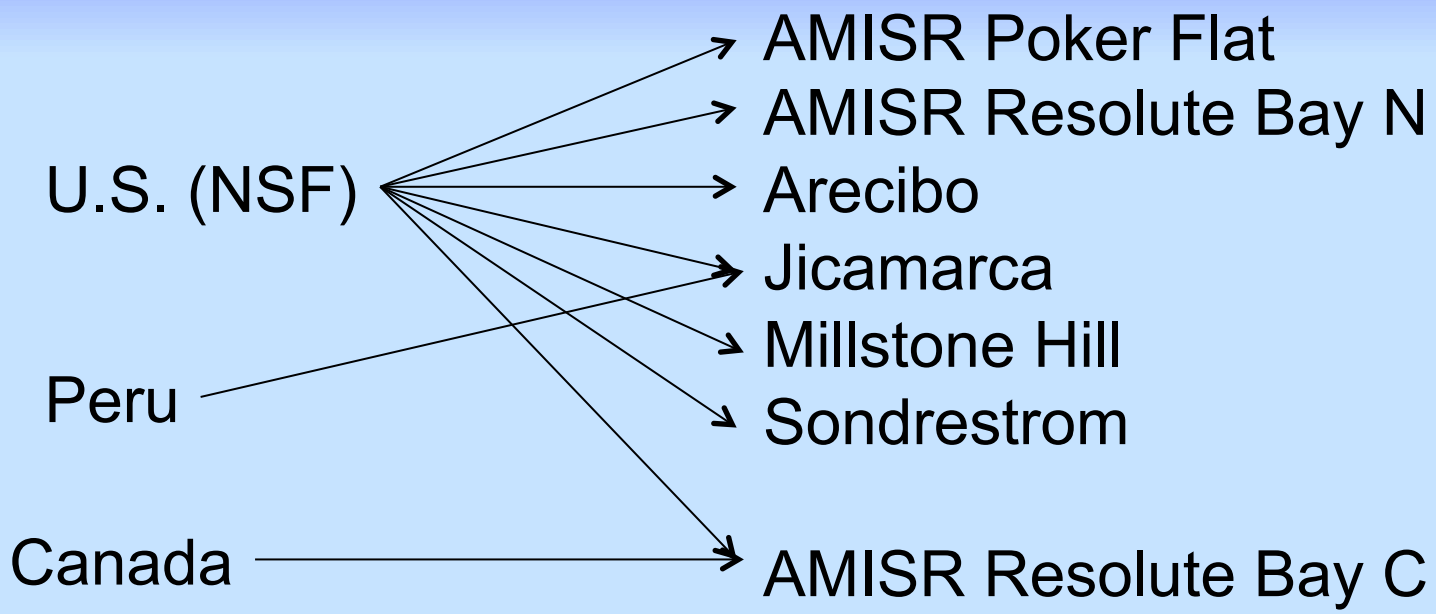
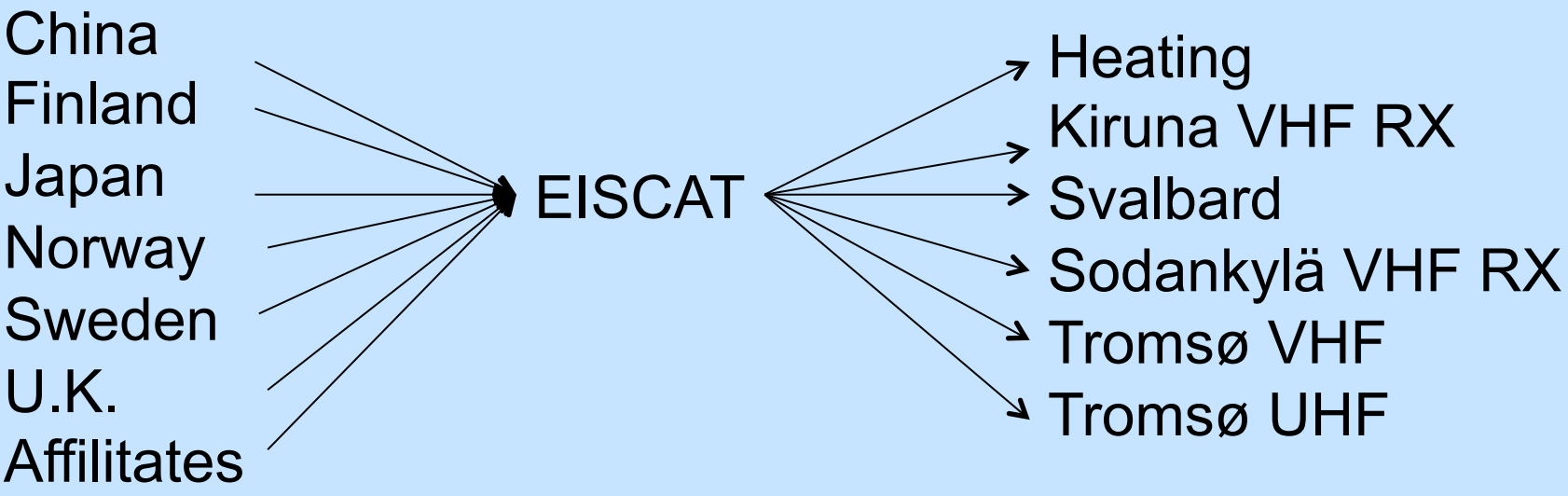


Figure 4.4. Spatial configuration of scientific work linked to EISCAT 2005-2013


University of California
Lebedev Physical Institute
Versailles Saint-Quentin-en-Yvelines University (UVSQ)
European Space Research and Technology Centre (ESTEC)
Space Research Institute (IWF)
Predictive Science Inc.
Centre d'Etude Spatiale des Rayonnements (CESR)
University College London (UCL)
Imperial College London
Max Planck Institute for Extraterrestrial Physics (MPE)
University of Wales
Joseph Fourier University
University of Oulu
Finnish Meteorological Institute (FMI)
University of Aberystwyth
University of Central Lancashire
Swedish Institute of Space Physics (IRF)
Institute of Space and Astronautical Science (ISAS)
Sodankylä Geophysical Observatory (SGO)
University of Southampton
Rutherford Appleton Laboratory (RAL)
Nagoya University
National Institute of Polar Research (NIPR)
Polar Geophysical Institute (PGI)
Graz University of Technology
University of Leicester
Stockholm University
University of Tromsø
University of Saskatchewan
Tohoku University
La Trobe University
Norwegian Defence Research Establishment (FFI)
University of Alaska Fairbanks (UAF)
Leibniz-Institute of Atmospheric Physics (IAP)
Lancaster University
EISCAT Scientific Association
University Center in Svalbard (UNIS)
University of Western Ontario
Max Planck Institute for Solar System Research (MPS)
University of Oslo
Arctic and Antarctic Research Institute (AANII)
Johns Hopkins University
University of Colorado
China Research Institute of Radiowave Propagation (CRIRP)
Xidian University
Institute of Radio Astronomy
Air Force Research Laboratory (AFRL)
Cornell University
University of New Hampshire
Hermanus Magnetic Observatory (HMO)
British Antarctic Survey (BAS)
Observatoire de Haute Provence (OHP)
GFZ German Research Centre for Geosciences
University of Bath
Stanford Research Institute (SRI) International
Polar Research Institute of China
Laboratoire de Physique et Chimie de l'Environnement et de l'Espace (LPCE)
Kyoto University
NASA Goddard Space Flight Center
Massachusetts Institute of Technology (MIT)
Laboratoire de Planetologie de Grenoble (LPG)
Collecte Localisation Satellites (CLS)
Centre d'Etudes des Environnements Terrestre et Planétaires (CETP)

MIMO Funding





Questions?