Current and Planned Space Weather Activities

presented by

Ingrid Mann

on behalf of Esa Turunen and Ian McCrea

from the EISCAT team

Members of EISCAT:

China, Finland, Germany, Japan, Norway, Unit. Kingdom, Sweden

Contributing:

France, Russia, Ukraine

Current EISCAT Measurement Capabilities: Parameters Produced

Incoherent Scatter:

- electron density
- electron temperature
- ion temperature
- line-of-sight velocity

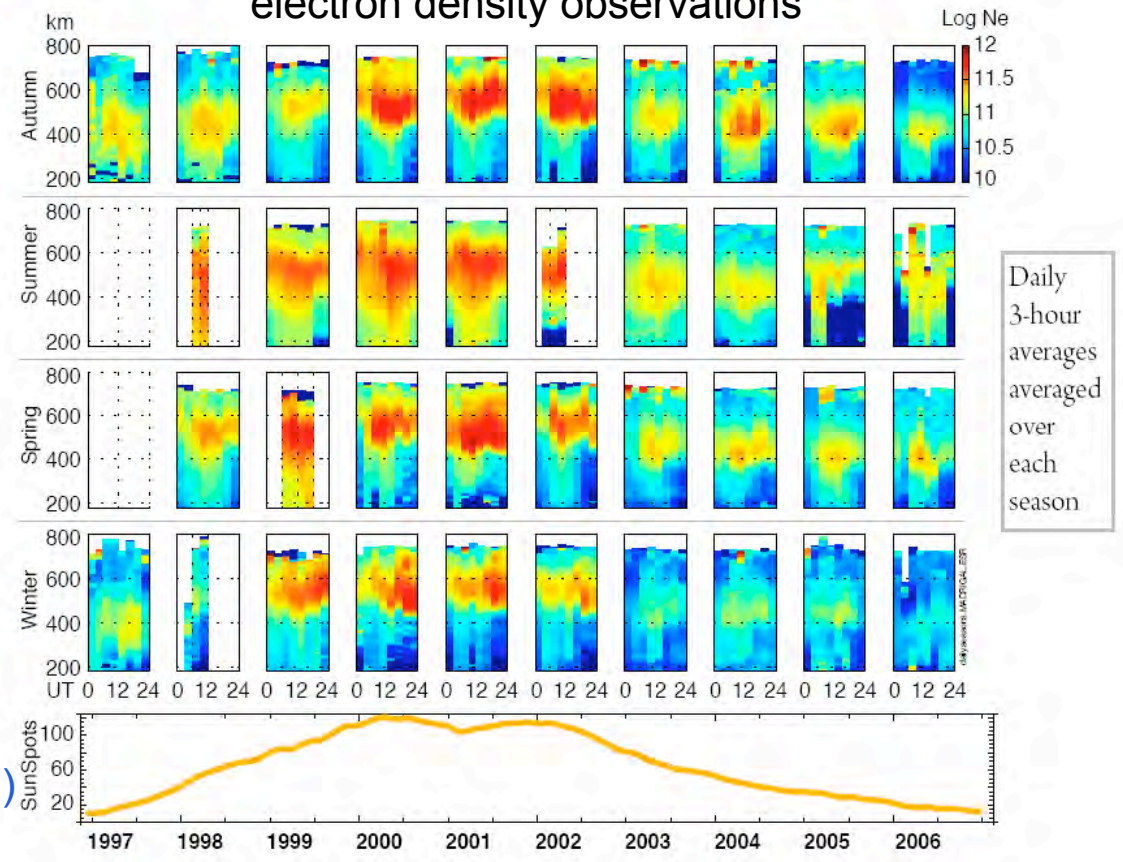
(~3500 hours/year)

Dynasondes:

- density profiles
- sky maps
- drifts

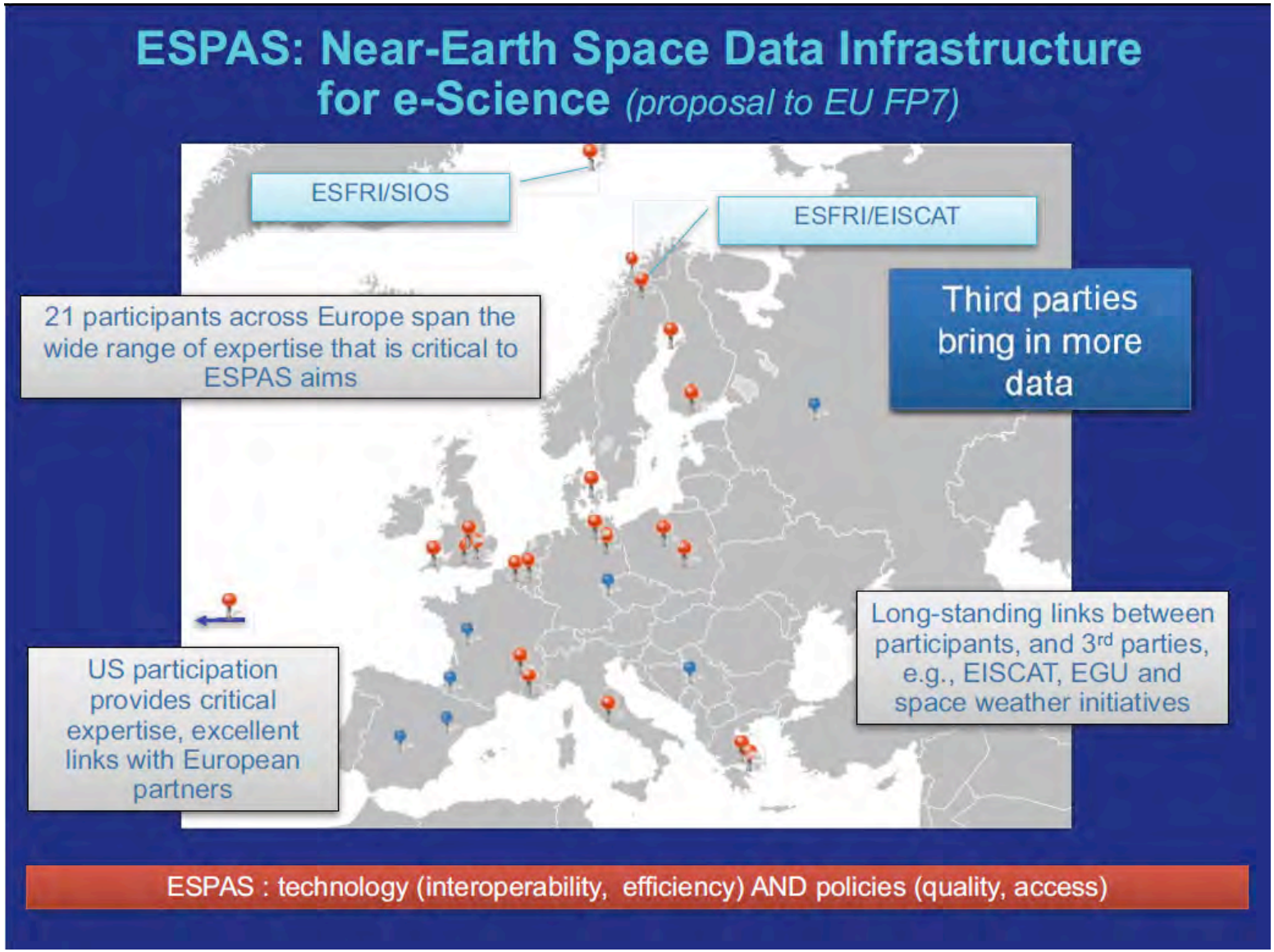
continuous measurement*)

EISCAT Svalbard Radar (ESR)
electron density observations



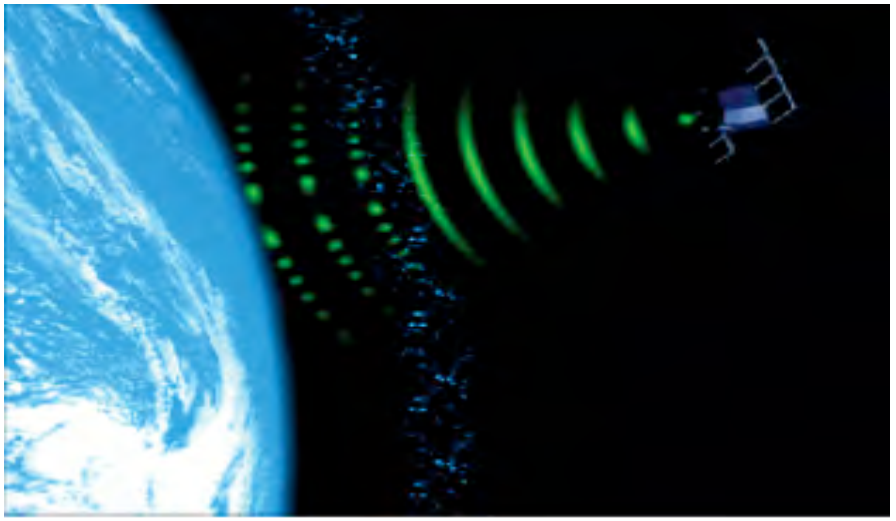
* New analysis software & database: http://dynserv.eiscat.uit.no

Space Weather@ EISCAT: ESPAS (FP7)



Space Weather @ EISCAT: TRANSMIT (FP7)

Initial Training Network focused on atmospheric phenomena affecting global navigation satellite system (GNSS) and related systems



48 months from February 2011

9 institutes, 7 countries

includes experiments at EISCAT supported by it's open peer-review programme

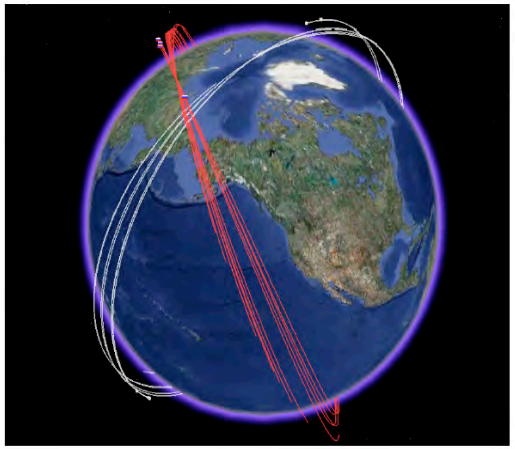
EISCAT Contributions to ESA SSA*

Space Debris measured with EISCAT

EISCAT UHF observations after **Iridium - Cosmos - satellite collision** and comparison to statistical debris model: model could be improved by using the EISCAT measurements (J. Vierinen et al., 2009).

EISCAT contributed to **ESA tracking campaign Nov/Dec 2010**

- Satellites tracked:
  - Cryosat,
  - Envisat,
  - JASON,
  - GRACE,
  - METOP,
  - PROBA



- ESA report comments favourably on EISCAT capabilities
- **Further EISCAT involvement envisaged in next phase of SSA**

*SSA: Space Situational Awareness

The new EISCAT_3D Project

an artist view

The new EISCAT_3D Project

- **Multistatic Phased Array**

  as EISCAT mainland systems

- **Multiple Sites**

  at least one will have transmitter **and** receiver

- **New Hardware & Software**

  significantly advances observing capability

The new EISCAT_3D Project

Cost	50 – 250 M€
	depending on size of system & number of sites
2008 -	ESFRI* Roadmap Infrastructure
2005 - 2009	Design study (FP6)
2010 - 2014	Preparatory Phase
2014 -	Construction

(* ESFRI: European Strategy Forum for Research Infrastructures)

The new EISCAT_3D Project

… supports international space weather efforts by:

- **providing continuous high-quality data**

  for monitoring and nowcasting

- **making data available**

  for applications and modelling

- **responding flexibly to space weather conditions**

  via adaptive experiments and intelligent scheduling

Future Plans and Wishes (@ spaceweather)

Projects

Coming FP7 round (2012 call)

- **Space Weather consortium call**
- **Joint EU/US infrastructures call**

New collaborations with **EU border states**

Further involvement with **ESA SSA**

New Capabilities

Third ESR dish on Svalbard

Precursor operations for EISCAT_3D

Future Plans and Wishes

- Coming FP7 round (2012 call)
  - **Space Weather consortium call**
  - **Joint EU/US infrastructures call**

- **Third ESR dish** on Svalbard (collaboration with China)

- **Precursor operations** for EISCAT_3D
  (LOFAR tests, use of new VHF frequency)

- New collaborations with **EU border states**

- Further involvement with **ESA SSA**

EISCAT Scientific Strategy

To understand the various forms of coupling between the Sun, the interplanetary medium, the terrestrial magnetosphere, ionosphere, and atmosphere of the high-latitude regions, natural and anthropogenic forcing,and related plasma physics and dynamics, and to achieve the necessary knowledge, understanding, principals, and techniques which would allow mankind to monitor, predict, and mitigate such processes within the next 30 years.

= Space Weather

2020 The Geospace Instrument Array

Facility Scale Instruments




Major Geospace Facilities
Large Radio Telescopes

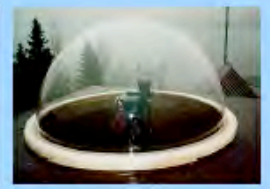
Medium Scale Instruments



SuperDARN Network
Low Cost IS Radars
Optics Arrays
(moderate numbers)

Small Scale Instruments






Software Radio Arrays
GPS Arrays
All Sky Camera Arrays
Magnetometer Arrays
(large numbers)

World Wide Web

Supercomputing Geospace Assimilation Grid

Geospace Search Engines

Virtual Observatories

Space Weather Models

Scientists Educators Public

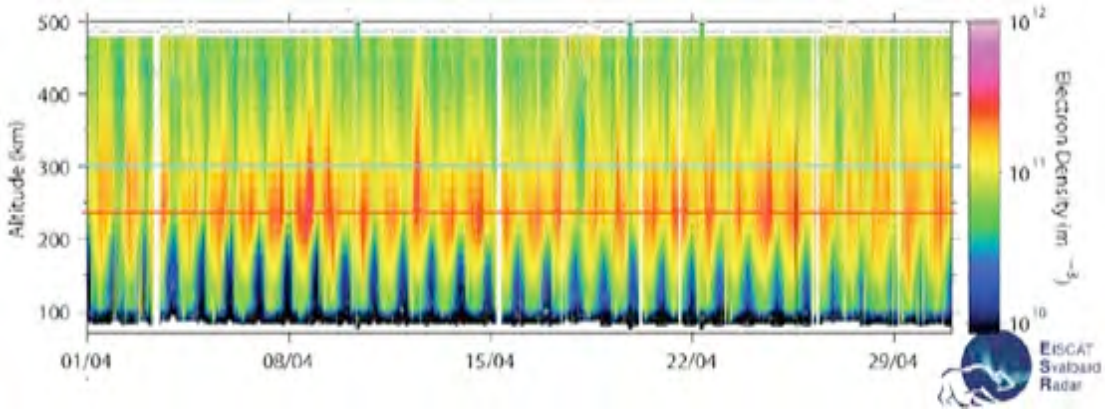
EISCAT_3D and Space Weather

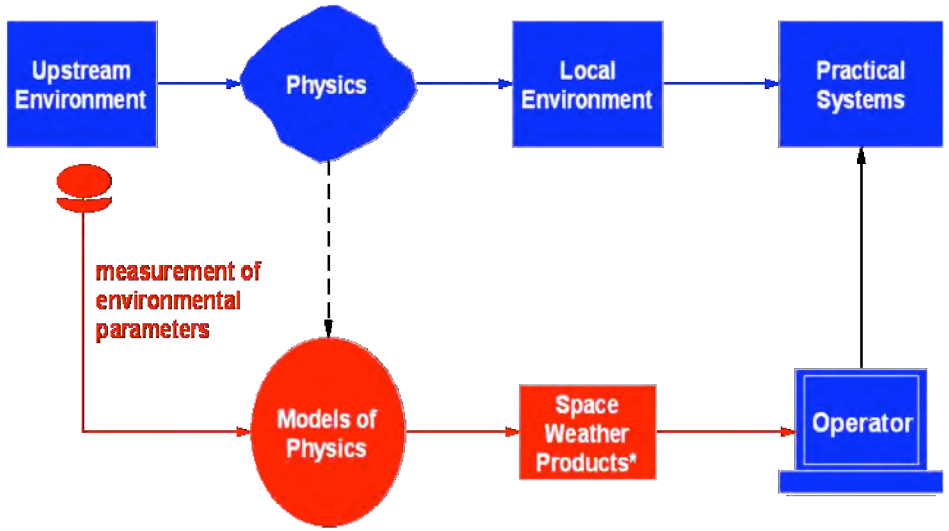
Support international space weather efforts by:-

•Providing continuous high-quality data for monitoring and nowcasting

•Making data available in an inter-operable form accessible to applications and modelling communities

•Responding flexibly to space weather conditions via adaptive experiments and intelligent scheduling

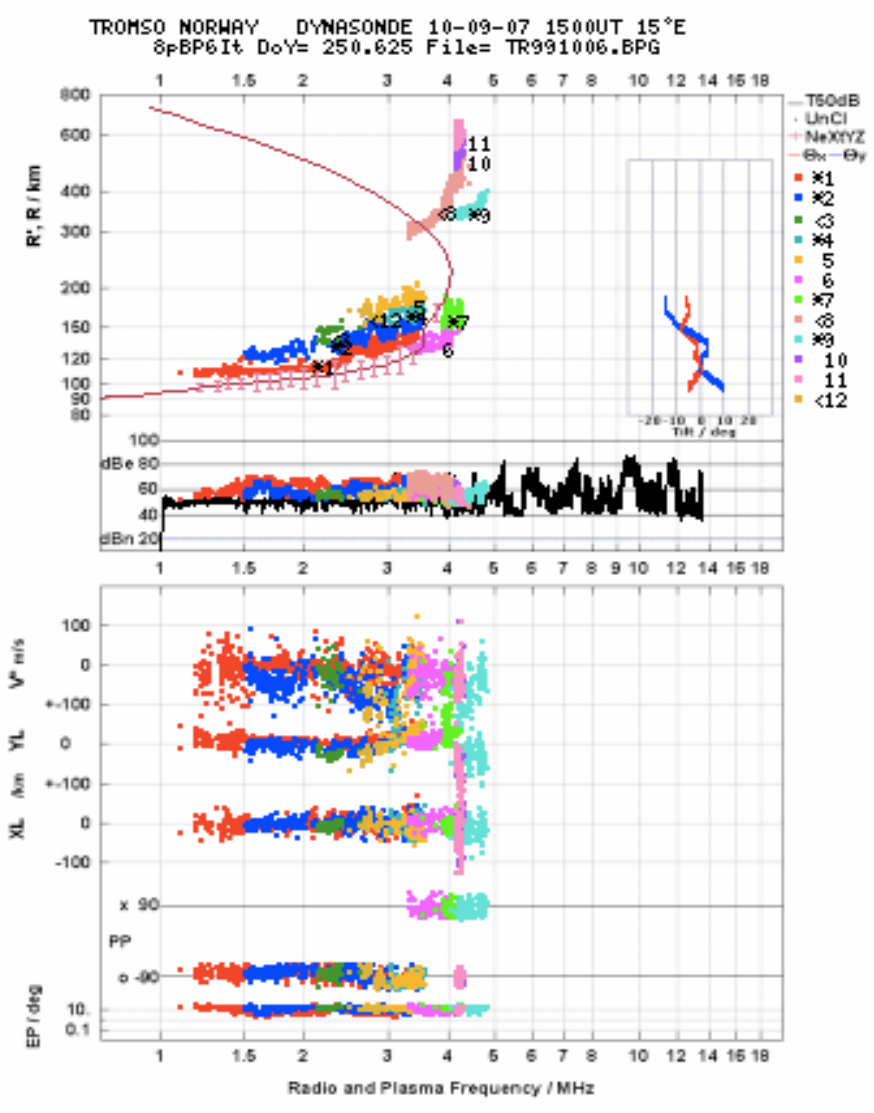




Space Weather@ EISCAT: New Dynasonde Capabilities

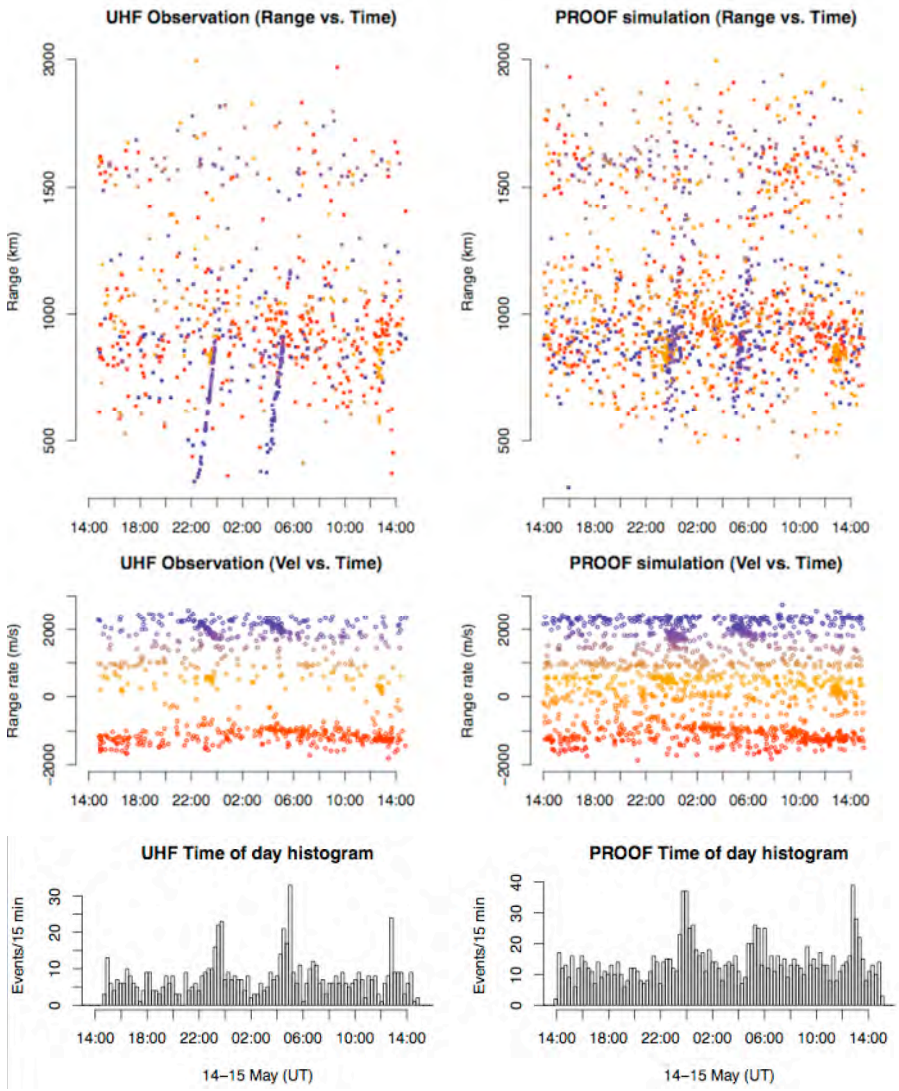
- New analysis software and database in Tromso
- Data from Tromso and Svalbard dynasondes
- New data products (e.g. ionospheric tilts)
- Global Dynasonde data

http://dynserv.eiscat.uit.no



Space Debris measured with EISCAT

Iridium-Cosmos satellite collision



(J. Vierinen et al., 2009)

Space Weather @ EISCAT: ENVRI (FP7)