Continuous
Incoherent Scatter data
through the
International Polar Year

Tony van Eyken
Director, EISCAT Scientific Association
1 March 2007 1630UT
Ingemar Häggström starts the IPY run
1 MW from eight TV transmitters
42m field-aligned antenna
Snow removal is a constant chore

Job done (for now)
~42 tons removed
25 August 2007

Fire in the AVR!

Longyearbyen  
24 January 2008

Polar Gateways

© EISCAT Scientific Association  
Tony van Eyken

Photo: Martin Langteigen
Essential work to tidy the transmitter Hall before the long run...
EISCAT Svalbard Radar
Irkutsk Radar

Photo: Institute of Solar-Terrestrial Physics
Millstone Hill Radar
Poker Flat Radar

Photo: Craig Hienselman
Sondrestrom Radar
SuperDARN

Saskatoon

...different, complementary, views
IPY IS Radar Operations

- EISCAT Svalbard Radar operates field-aligned continuously
- Poker Flat Radar operates continuously
- ESR, Millstone Hill, and Sondrestrom run local scans one day every two weeks
- Sondrestrom supports the ESR during planned maintenance, etc
- Profiles of electron density, electron and ion temperatures and line-of-sight velocity at least once per hour
- Electron densities typically calibrated using simultaneous plasma line measurements
- Bi-weekly combined observations also use scans to derive electric fields
- Analysed and validated data available through distributed, web-based, data system (Madrigal) and integrated into various data portals
- Close cooperation with other programmes in the ICESTAR/IHY portfolio
- Most extensive, and most detailed, dataset describing the polar atmosphere ever collected
Irkutsk

Running one month 'on', two off, all year
EISCAT: Space debris

- Observations in 2005: UHF/Tromsø (675 hours), ESR (24 hours)
- Observations in 2006: UHF/Tromsø (378 hours), ESR (138 hours)
- Since March 13th 2007, continuous observations with the ESR as part of the IPY (International Polar Year)

EISCAT Svalbard Radar (ESR) results in March 2006 and June 2007

March 2006, 18th-21st

June 2007, 4th-7th

Impact of Jan. 11 ASAT test
Space debris: March

- Epoch: March 13th, 2007
- Distinct peaks at 6h and 12h UTC, due to a fresh, dense cloud
- Well reflected through the model
Space debris: August

- Epoch: August 23rd, 2007
- Slightly dispersed peaks
- Not very well reflected through the model

![Graph showing number of objects over time](image)
April

- Red line is the approximate mean height of the observed F2 peak
- Orange line is the modellers’ belief of where it should be
- Changing the temperature to take account of the reductions seen in the long term values by Millstone Hill accounts for most of the differences in altitude and peak density
- Climate modellers have suggested that doubling the amount of green-house gasses in the atmosphere would result in a reduction in the F2 peak altitude of about 40km
Data available in popular formats, including flat ASCII files, for free download

APIs support program access, including support for VOs

Distributed, free, data access system with extensive user and application programming interfaces. www.openmadrigal.org
Welcome to the Virtual Solar Terrestrial Observatory (VSTO)

The Virtual Solar Terrestrial Observatory (VSTO) is a unified semantic environment for solar, upper atmosphere, terrestrial, and space physics (SSTSP), currently:

- Upper atmosphere data from the CEDAR (Coupling, Energetics and Dynamics of Atmospheric Research) network.
- Solar corona data from the MLSO (Mauna Loa Solar Observatory) archive.
- Knowledge base (KB) services from heterogenous data sources.

VSTO provides access to data and tools through a portal and data services.

VSTO Portal

Data Services

MLSO Data Services
NEWS

Ionospheric Challenges of the International Polar Year

PAGE 111

Fifty years ago, the first International Geophysical Year (IGY) generated a huge step function increase in observations of ionospheric variability associated with the almost continuous geographic activity experienced during the solar maximum of the past 50 years. In turn, these observations fuelled more than a decade of theoretical advancement of magnetospheric-thermospheric coupling and coupled processes. In that context, the current International Polar Year (IPY) 2007-2008 is occurring during a time when we will still be in the deep solar minimum in 15 years. Potentially, it could be a very geomagnetically quiet period, a period during which ionospheric variability will be driven by processes in the thermosphere and ionosphere. Since the variability of the ionosphere-thermosphere system associated with the upward propagating thermospheric Kelvin waves which, in turn, modulate the lower atmosphere, is expected to be independent of the solar cycle, the IPY period is an ideal time to address this interaction between the lower and upper atmospheric region.

Tony van Eyken

References


International Space Station Supports International Polar Year

Fig. 1: Advanced Modular SSR, Alien FTA, Alaska (60°N 167°W, 112°E 15°W).
"...space, ground based, and laboratory researchers, and modelers."
Goals

• Capitalise on the unique opportunity represented by the huge increase in data availability during the International Polar Year (IPY) of 2007-9 to dramatically improve the quality of models and the underlying physical understanding, and in particular to develop their capabilities in now- and fore-casting.

• Two main threads, the first related directly to the development of the model-data comparison and model improvement, and the second related to understanding some of the important classes of phenomena revealed by the observational and modelling programs.

• Use the year-long ISR runs not just to validate the physics of high latitude ionospheric models, but also as input data for assimilation models.
The ISSI project
'Towards more effective physics-based and statistical models of the polar ionosphere'

WS1: 31/10-3/11 2007
Funding from ISSI, Norwegian IPY, NSF, and participant’s organisations
6 papers planned on initial results

WS2: 12-17/05 2008

What happens after the IPY?

• Collected data will be the reference against which models and theories are tested for the next 50 years
• Studies and collaborations established under the drive of the IPY will continue and grow
• Thirst for high quality data drives demand for new, even better, and wider coverage
An IS radar in Antarctica?

Conjugate mapping of the Resolute Bay service area

Craig Heinselmam, SRI
Thank you for your attention!