

SCAR perception of the GWSWF Action Group

The SSG/PS perspective

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INGV

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SCAR Cross-Linkages Workshop, Nov. 6-8th, 2006

Societa Geografica Italiana, Villa Celimontana, Rome, Italy

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Jane Francis, UK, Member ACE SRP

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Kirsti Kauristie, Finland, Co-chair ICESTAR SRP

Chuck Kennicutt, USA, Secretary SALE SRP, V-P SCAR

Toni Meloni, Italy, Vice President SCAR

Guido di Prisco, Italy, Co-chair EBA SRP

Volker Rachold, Sweden, Director IASC (by telephone)

Claudio Rafanelli, Italy, Member JCADM

Colin Summerhayes, UK, Executive Director SCAR

John Turner, UK, Chair AGCS SRP

Report based on minutes compiled by Colin Summerhayes (thanks!)

LOCATION



AGENDA

- (i) primary objective:
 - to encourage the **development of cross-discipline research** within SCAR,
 - to develop concrete actions that will lead to a **closer working relationships between SCAR's SRPs and the SSGs**, including ways to make these interaction work better – such as joint sponsorship of workshops, science sessions at meetings, combining efforts on education, outreach and communication, and on data where appropriate, and
 - other activities that will bring the communities together.
- (ii) how are the different SRP planning to deal with the data sharing and archiving issues.
- (iii) IPY developments

During the meeting.. More linkages

- There are potential links between SSG-GS and SSG-PS in using the networks of GPS receivers in the SSG-GS geodetic network, which can be used for ionospheric tomography:
- **Proposal from SSG-PS ICESTAR, SSG-GS POLENET (IPY projects).**

UAMPY (Upper Atmosphere Monitoring for Polar Year) consortium formed by:

- INGV (Istituto Nazionale di Geofisica e Vulcanologia - Rome, ITALY)
- IFAC/ISC-CNR (Istituto di Fisica Applicata "Nello Carrara"/ISC, Florence, ITALY)
- UNIVERSITY OF BATH (UK)
- SRC-PAS (Space Research Center, Polish Academy of Sciences Warsaw, POLAND)
- UNIVERSITY OF CALGARY (CANADA)
- HMO (Hermanus Magnetic Observatory, Hermanus, SOUTH AFRICA, together with other collaborators of the South African Space Physics community):
 - ISSA (Institute for Satellite and Software Applications)
 - HartRAO (Hartebeesthoek Radio Astronomy Observatory)
 - NWU(Northwest University)
 - UND (University of KwaZulu-Natal in Durban)
 - UP (Department of Electrical, Electronic and Computer Engineering, University of Pretoria).

International Polar Year

• 2006: American Geophysical Union

- [Weatherwax, A.; Kauristie, K.; Stamper, R.; Papitashvili, V.; Fraser, B.; Ostgaard, N.; Candidi, M.](#)

Abstract

- **ICESTAR and IHY initiatives together with 27 other multinational research projects will form one of the core projects of the forthcoming International Polar Year (IPY, March 2007 - March 2009): IPY ID 63 "Heliosphere Impact on Geospace".**
- The project has three main themes in its scientific work:
- (i) Coupling processes between the **different atmospheric layers** and their connection with solar activity,
- (ii) Energy and mass exchange between the ionosphere, the magnetosphere, and the heliosphere, and
- (iii) **Inter-hemispheric similarities and asymmetries** in geospace phenomena.
- Examples of topics to be addressed are **remote sensing of ionospheric** and radiation belt **dynamics** and of global geoelectric circuit, effects of solar energetic particles in mid-atmospheric chemistry, and planetary waves in the coupled mesosphere-thermosphere- ionosphere system. The final goal is to achieve better understanding on the geospace response to solar activity as a unified system and consequently to improve our capabilities to predict space weather phenomena. In addition to high-quality science IPY anticipates its core projects to conduct comprehensive education and public outreach activities and to develop efficient data sharing methods. This presentation will discuss main scientific challenges of the ICESTAR/IHY project in the context of the IPY overall picture. Some examples of planned observational campaigns and outreach activities will be presented and the progress in the establishment of virtual observatories will be described.
- **Upper Atmosphere Monitoring for Polar Year 2007-2008 (UAMPY)** L. Alfonsi
- [Techniques to study solar terrestrial interactions, but 1](http://classic.ipy.org/development/eoi/details.php?id=55)

2. GOALS, OBJECTIVES, AND IMPLEMENTATION OF THE SPECIAL RESEARCH PROGRAMMES

(they will be covered in the individual SRP presentations)

- Discussion identified need to link AGCS work on upper atmosphere cloud and tropospheric warming to research going on in CAWSES and ICESTAR.

Action 8: work on links between AGCS and ICESTAR (ongoing). Possible linkages between AGCS and the solar terrestrial community: gravity waves propagating upwards from the troposphere, possible area for collaboration. COORDINATE WITH CAWSES2 (SCOSTEP)

6. BREAK-OUT GROUPS: SPECIFIC REQUIREMENTS FOR IMPROVING LINKAGES

- 6.1 POLENET-ICESTAR-GPS-Meteorology
- Action 29:create a POLENETICESTAR-GPS-Meteorology Working Group within GIANT. **AG CREATED IN SSG/PS TO DEVELOP INTO SRPPG WITH SSG/GS**
- 6.2 Climate Change (AGCS-EBA)
- Action 30:continue with the planning for an Antarctic Climate Analysis with a view to producing a book draft for XXX SCAR, and developing a budget plan for the Executive Committee. **ACCE. MERGE: Microbiological and Ecological Responses to Global Environmental Changes in Polar Regions**
- 6.3 Weather and Upper Atmosphere Linkages (AGCS-ICESTAR)
- Action 31:check the funding status of TIMIS, check plans for preparatory work with the existing databases, and introduce people to the above mentioned opportunities for collaboration. **TIMIS NOT FUNDED**
- 6.4 EBA-SALE-ACE(+)
- Action 32: establish the joint ACE, EBA, SALE working group to examine the history and effects of refugia **SESSION EVOLUTIONARY BIOLOGY AT ISAES 2007**

Physical Sciences SSG Business Meeting

St Petersburg, North Hall, Pribaltiskaya Hotel, July 6-7, 2008

...15. ICESTAR-POLENET New initiative (L. Alfonsi)

- A new Action Group to develop ionospheric imaging capability in conjunction with POLENET and ICESTAR members. The initiative would provide data for space weather and weather forecasting, the latter **particularly through measurements of atmospheric water vapor**. This presentation included scientific detail of ionospheric tomography techniques and results.

2. New Action Group: GPS for weather and space weather forecasting SCARXXX- SSG/PS-2

- ... aims to bring together researchers from the former ICESTAR SRP with the POLENET network to provide ionospheric imaging, facilitate data and technology exchange with the broader community. Using new techniques, the group will deliver greater understanding of the polar ionosphere and ionospheric processes.

Objectives:

- Ionospheric imaging over Antarctica.
- Exchange of data and expertise for the application of tomography to other fields of interest for both communities (e.g. 3D water vapour reconstruction).
- Exchange of technologies to install and manage remote GPS stations.
- Possibility to host instruments in the polar stations of the two communities.

Deliverables:

- One meeting per year among the WG members
- Joint publications on peer reviewed journals
- Joint presentation at national and international conferences
- Web site realization, maintenance and updating
- **SSG/PS also notes interest from the wider physical sciences and geosciences community in using POLENET for new applications, including a proposal from SSG/GS for a Scientific Program Planning Group on Solid Earth Response and Cryospheric Evolution (SERCE) that will use POLENET data. SSG/PS encourages development of new linkages with the proposed "GPS for Weather and Space Weather Forecasting" action group.**

SSG/PS groups

Punta Arenas

July 2009

1. ISMASS

2. IPICS

3. Oceanography

4. ECA

6. GPS

7. PCBEA

8. PACT

9. OP.Met.

10. PAntOS

11. CCER-SAE

SSG/PS

GPS for weather and space weather forecasting

G. DeFranceschi

The POLENET and ICESTAR - UAMPY (Upper Atmosphere Monitoring for Polar Year) Communities are cooperating to achieve the following:

Ionospheric imaging over Antarctica (planned by both projects).

Exchange of data and expertise for the application of tomography to other fields of interest for both communities (e.g. 3D water vapor reconstruction).

Exchange of technologies to install and manage remote GPS stations.

Possibility to host instruments in the polar stations of the two communities.

Action Group representatives from **Italy, the UK and Brazil had a meeting during AGU Fall Meeting in San Francisco** to discuss the activities to be carried out in 2009. **A workshop is planned for Sept. 2009, to be held in Rome.**

This workshop will stimulate international collaborations on the use of GPS for neutral/ionized atmosphere investigations over the Arctic and Antarctic, to coordinate the efforts on data management and treatments and to plan the use of existing infrastructures and facilities to optimize the network.

PROGRAM OF WORKSHOP AVAILABLE (GDF pres?)

Draft Strategic Plan for the SCAR

SSG/PS July 12, 2009 (as of Punta)

Areas of significant advance in the research within SSG/PS lie at interfaces. **Interfaces among physical regions, regions that are vastly different with respect to physical parameters**, e.g. the interface among the cryosphere and the atmosphere, or the interface among the troposphere and the upper layers of the atmosphere up to the ionosphere. **Interfaces among scientific research areas, or even disciplines**, e.g. physics and chemistry, or studies that concern the same system with different approaches and techniques, like upper atmospheric research. Cross disciplinary approach and boundary system research are key to advance in such areas.

Climate

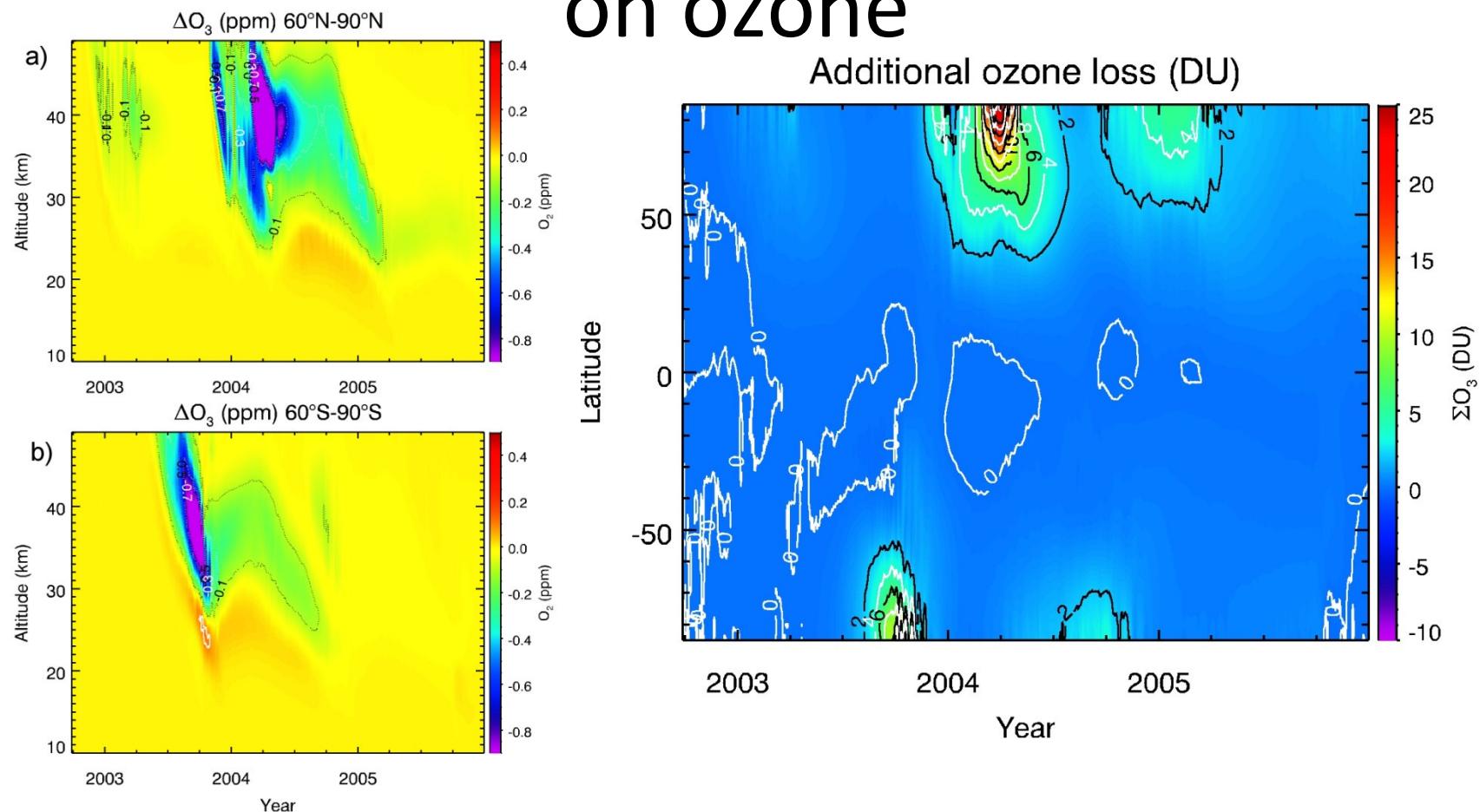
One of the major challenges as regards the climate aspects of physical sciences is to understand **the couplings of the physical ice-ocean-atmosphere system in the cryospheric region** where records are shortest and knowledge is most limited. Antarctica and Southern Ocean are regions of key importance to the global climate system and the mechanisms and patterns of variability over decadal to centennial time scales are not well understood.

To date, the view of Antarctic / Southern Ocean region climate variability has been largely atmosphere-centric, with relatively little being understood of **oceanic and ice feedbacks onto the atmosphere. SCAR should take a lead in the promotion of research in this interface area, and in coordinating observational and modelling efforts** that contribute toward this major challenge, by helping to set up or consolidate the basic elements of an Antarctica and Southern Ocean observing system and by coordinating model intercomparisons.

Another (hitherto understated) key strand that SCAR should take a lead on **is bringing biogeochemistry (particularly the carbon cycle) into this effort**, perhaps by establishing a new cross-discipline task force.

The interface of AGCS with the upper atmosphere should be analysed with greater attention. Interaction with ICESTAR and the related SCAR groups GPS and PACT, should be enhanced. The group on Operational Meteorology is naturally connected with the AGCS program.

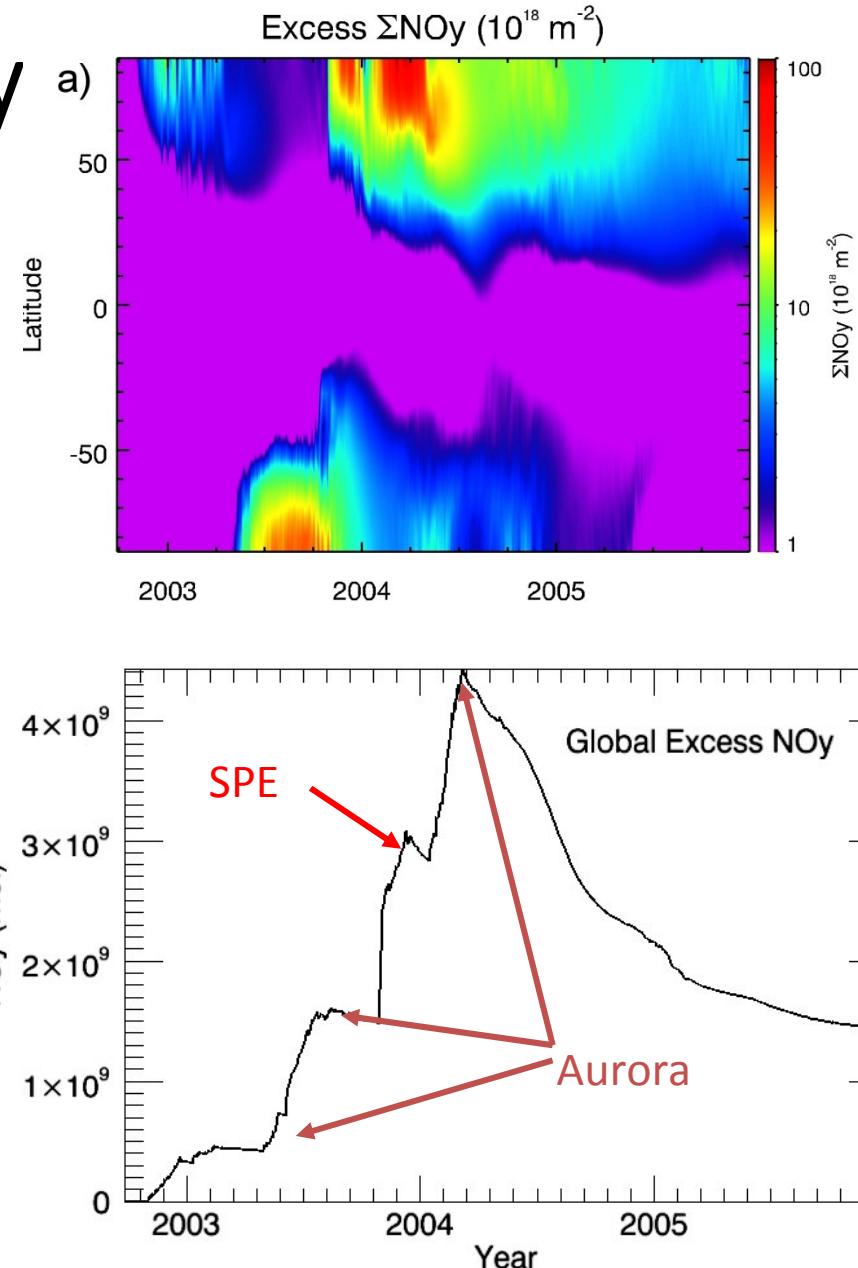
Disturbed chemistry: long-term effects on ozone



- Ozone changes related to NOx intrusions can be followed $> 1\text{y}$
- Mostly restricted to high latitudes

Effect on global NOy

- Ozone destruction capacity estimated by total reactive nitrogen NOy
- Chemical lifetime $\rightarrow \infty$, removed by STE processes and sedimentation of PSCs
- Total additional NOy during the observed period ($0.4 + 1.4 + 1.5 + 2$) Gmol
- Corresponds to 5% of total NOy
- Atmospheric lifetime about 2 y
- **Persistent EPP related NOx would increase total NOy by about 10%**
- **Main contribution from 'Auroras'**



3rd HEPPA Workshop

9-11th May 2011

Granada (Spain)



Topics

- Precipitating Particle Sources
- EPP effects on the Thermosphere & Ionosphere
- Direct EPP effects on the middle and lower atmosphere
- Indirect EPP effects: Atmospheric coupling and Climate effects
- Coordinated Model/measurement inter-comparison
- Future measurements

Coming soon: <http://www.iaa.es/heppa.html>

STP

-Improving our understanding about **the boundary layer between the atmosphere and near-Earth space**. Now the general trend is to improve the atmospheric models in their lower boundary conditions (i.e. atmosphere-biosphere interactions, sea-atmosphere interactions, anthropogenic influences). With the progress in this work it becomes increasingly important to advance our understanding on the upper boundary as well. Incoherent scatter radars (ISR) provide unique opportunities to monitor the transition region between atmosphere and geospace. Support should also be provided to those modelling efforts which address the interpretation of bi-polar ISR observations (e.g. the development of the TRANSCAR model).

-The **next sunspot maximum** is approaching and consequently **the space weather issues will again gain more attention**. The Australian WDC for space weather has done valuable work during the recent years in providing space weather services also for the southern hemisphere.

These services should be raised roughly on the same visibility level as the northern hemispheric space weather services. The POLENET mission to monitor ionospheric conditions above both polar areas could be a flagship in this work. The electron content maps that Polenet will hopefully produce will be useful to support various navigation and communication services.

Coordination between ICESTAR and specialized groups within SCAR is to be improved; groups like [GPS for Weather and Space Weather Forecasting \(GWSWF\) \(Cross SSGs Group\)](#) and [Polar Atmospheric Chemistry at the Tropopause \(PACT\)](#) will need to coordinate and operate in concert with ICESTAR.

Flavour of documents: wording generally alludes to the Earth system, and does not extend to space and the cosmos

- Doc. on “Ant. Sci. And Policy advice in a Ch. World”:
 - “SCAR’s area of interest includes Antarctica, its offshore islands, and the surrounding Southern Ocean including the Antarctic Circumpolar Current.”
 - It should be phrased in a way that extends the area of concern to space and the cosmos.**
 - this would comply with following “point 4) reflects changes in SCAR membership and focus”, to take note of the extension of SCAR to IAU.
 - “SCAR as a Charity”: ..all aspects of the Antarctic region: add **“and space over Antarctica, and the observable cosmos from Antarctica”**
 - Strategic goals, first bullet: “ ..advance knowledge of our planet..” add: **and space and the cosmos at large.**
 - Strategic goals, second bullet:”..role of the Antarctic region in the Earth system”..**add: “and beyond”**

SSG/PS SRP planning groups

**1. GWSWF (GPS for Weather and
Space Weather Forecasting) with
SSG/GS**

Phased procedure for SRP's

- **Proposal to Delegates at Buenos Aires (August 2010) will have to be ready for documentation to be provided in advance of Delegates meeting. “DEFINE DURATION”**
- **If approved: Implementation Plan**
- **Yearly reports of activity wrt Implementation Plan (in particular during years of SCAR meetings the report is to be submitted in time for SSG report to Delegates)**
- **Final report wrt proposal**

SCAR vision of GPS

Standing Scientific Group on Physical Sciences (SSG-PS)

.. A distinct component of physical sciences research in Antarctica is based on the unique properties of the continent that favor its use as a platform for astronomical and solar-terrestrial observations.

.. the position of the magnetic south pole makes Antarctica (like the Arctic in the north) a region where interactions between a variable star, our Sun, and the Earth can be best monitored from the ground.