



Gps for Weather and Space Weather Forecast

SCAR Action Group

II Meeting

DIMeC, MODENA April 11-12, 2011

Giorgiana De Franceschi, INGV-RM2, Rome Italy



Monday April 11th

- **12.30-14.00** Registration and Lunch

chair MN

- 14.00-14.30 Welcome and introduction **Monia Negusini/Giorgiana DeFranceschi**
- 14.30-15.00 SCAR structure and strategy **Antonio Meloni**

- 16.00-16.30 **Coffee**

- 16.30-17.00 GNSS data format for atmospheric studies: the ESWUA system
V. Romano/L. Spogli

- **20.00-22.00** Social dinner at "TAVERNA DEI SERVI", Via dei Servi 37, Modena

Tuesday April 12th

chair GDF

- 09.30-10.00 SCAR SSG/GS perspective **Alessandro Capra**
- 10.00-10.30 SuperDARN **Ermanno Amata**
- 10.30-11.00 Inputs from all on Implementation plan **All**

- **11.00-11.30 Coffee**

- 11.30-12.00 Where do we go from here? **All, Paul Prikryl**
- 12.00-13.00 Thematic groups form **All**

- **13.00-14.30 Lunch**

- 14.30-15.30 Thematic groups meet in splinter
- 15.30-16.00 Thematic groups report to plenary **Thematic group speaker**

- **16.00-16.30 Coffee**

- 16.30-17.00 Leadership of thematic groups **All**
- 17.00-17.30 Deadlines and deliverables **All**

CLOSE MEETING

Main objectives of the GWSWF Action Group:

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

First steps since SCAR 2008....

2008-Action Group representatives from Italy, UK, and Brazil had an informal meeting during AGU Fall Meeting (December 2008) in San Francisco to discuss on the activities to carry on in 2009.

•**2009-**The first Action Group meeting was held at INGV, Rome, (September 2009). It was partially supported by SCAR- SSG Geoscience. About 25 participants from IT, UK, PL, SA, CA, BR, FI, SL. Discussions focused on the need to establish a permanent network of GNSS receivers for a multi-purposes investigation over Arctic and Antarctica (e.g. 3D water vapor reconstruction and ionospheric imaging), and on international collaboration addressed to bi-polar investigations particularly at conjugate regions. To facilitate these processes, it was envisaged the establishment of a common portal where data and products will be available for scientific communities.

•**2010-**The BM was held during the SCAR OS in Buenos Aires (August 2010) attended by several Countries and Institutions. Several papers (oral and poster) were presented during the OS. The goal to enlarge the GISTM network was reached in Antarctica with success. Some new Institutions and Countries expressed their interest in supporting and collaborating with the AG. The BM report was posted to SCAR.

•**2011-**The Annual Report (2010) and the announcement of the II GWSWF meeting has been posted to SCAR and circulated. Funds has been provided by SCAR SSG GS and PS.

EXPERIMENTAL OBSERVATIONS

Efforts have been addressed to develop and enlarge the GISTM (GPS for Ionospheric Scintillation and TEC Monitor) network at Southern and Northern high-polar regions. The last GISTM receivers have been deployed by Brazil during the last Antarctic Campaign 2010-2011. Some GISTM receivers in Antarctica were set for a feasibility study on the possible use of the data acquired by the ionospheric community to reconstruct the water vapor concentration.

SCIENTIFIC RESULTS

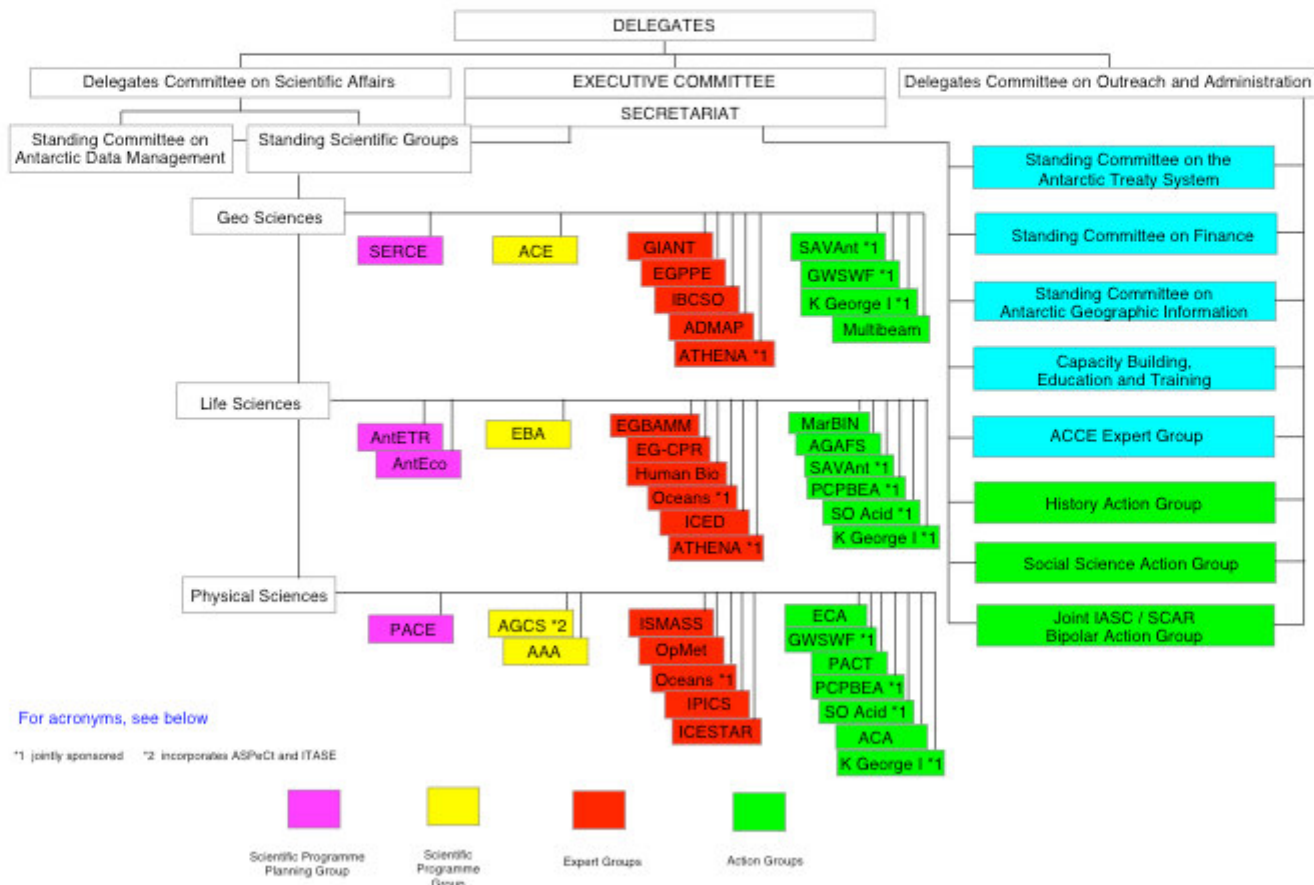
Several papers have been presented/published mainly related to the use of GPS and GISTM data for ionospheric plasma dynamics investigations at high latitude. The “climatology” of scintillation has been developed and studied at both the polar regions highlighting the role of the auroral oval boundaries and the cusp region in the occurrence of the ionospheric scintillation. Experiments to derive the drift velocity of ionospheric irregularities have been carried out as well errors mitigation techniques due to ionospheric scintillation have been developed and applied to GISTM data at both polar regions.

WEB SITE WWW.GWSWF.SCAR.ORG

It has been developed and hosted by INGV. It contains information on the Action Group activity, contacts, description of polar infrastructures available, and a simple data form to be filled by participants: products and tools can be uploaded to support data analysis.

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The Organisation of the Scientific Committee on Antarctic Research (SCAR) (January 2011)





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Science & Data



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- ACE

GPS for Weather and Space Weather Forecasting (GWSWF)

A joint GeoScience and Physical Sciences Action Group

- [GWSWF website](#)

Reports

- [Agenda and Highlights from the GWSWF business meeting](#) at XXXI SCAR in Buenos Aires, Argentina, 1 August 2010
- [Minutes of the GWSWF business meeting](#) at XXXI SCAR in Buenos Aires, Argentina, 1 August 2010
- [Report of the meeting of the Action Group](#), held at the Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy, 10-11 September 2009.

Objectives of the Action Group

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

1. Ionospheric imaging over Antarctica (planned by both projects).

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GPS for Weather and Space Weather Forecast (GWSWF) is an Action Group endorsed by SCAR. It is a joint SSG-GeoScience and SSG-Physical Sciences Action Group.

PROPOSED SCIENCE PLAN - Introduction

The high latitudes ionosphere contains the footprints of processes that have their origin in the interplanetary space. Many different techniques are now available for probing the ionosphere, from radar measurements to the analysis of radio cosmic noise. Among them the use of GNSS high rate (50 Hz) measurements allows to image the 3D plus time evolution of the ionospheric plasma over restricted regions. Mathematical techniques combined with experimental observations provide the ability to study the ionosphere from high in the F-region to the bottom of the D-layer. The coupling processes from the magnetosphere and to the neutral lower atmosphere can be considered. At high latitudes, perturbations due to solar events have a high occurrence rate even during the solar minimum. These spatially distributed perturbations that propagate towards middle latitudes with variable time delays can seriously degrade technological systems useful for human life.

Scientific Content

Because of the lack in GNSS high-rate sampling receiver coverage over polar regions, particularly in Antarctica, the **Action Group** will contribute to answering questions that are still open within the Sun-Earth interactions studies. Some of the current issues in scientific international debate of particular interest are:

1. characterization of the cause-effect mechanisms driving the formation and evolution of ionospheric irregularities;
2. distribution and evolution of precipitable water vapour in polar regions which play a key role in the characterization and evolution of global earth phenomena.

Proposed Scientific Objectives

1. Encourage the establishment of a permanent network of GNSS receivers for a multi-purposes investigation over

VS: Second GWSWF Meeting 11 - 12 April

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INTEREST AND SUPPORT

Italy, UK, Poland, Canada, USA, South Africa, Brazil

Argentina, Australia, China

FROM USA GARY BUST gbust@astraspace.net

Call for paper

A study in Antarctica for the recent **storm March 1 - March 3 2011**. We have scintillation receivers at South Pole, McMurdo and the AGO site P3. I am hoping to look at the **scintillation data** and other correlative data from the region including **riometer data, magnetometer data, and VLF data**. I'm also planning on using my **data assimilation algorithm IDA4D** to do large scale imaging of electron density to correlate it with the scintillations.

UoB (UK), AI Weatherwax (USA, ICESTAR), INGV (Italy) gave their adhesion. I would welcome anyone else who wants to be involved on this project with data / models or whatever, I would plan on having anyone who wants to be involved as a co-author on any papers / presentations that result.

Please let the community know.