

SCAR Expert Group GRAPE (GNSS Research and Application for Polar Environment) Meeting

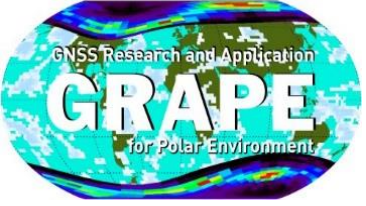
URSI AT RASC

Gran Canaria, 18-22 May 2015 ExpoMeloneras Convention Centre

Monday 18 - 16.00-17.30

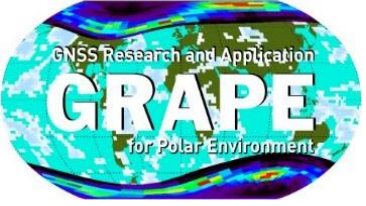
AGENDA

- G. De Franceschi – Welcome, 5 min
- A. Meloni - SCAR “Science, Structure and Organization”, 10 min
- G. De Franceschi – GRAPE “Report on the current status and future activities within SCAR Antarctic and Southern Ocean Science Horizon Scan (Priorities for Antarctic Sciences)”, 10 min
- L. Alfonsi P. Cilliers E Correia – An international pilot project: DemoGRAPE (It, SA, BR), 10 min
- Burrell - SuperDARN and possible interaction with SCAR/GRAPE community, 10 min
- Meloni –SuperDARN at Concordia (Antarctica), 10 min
- P. Prikryl, D. Themens - The CHAIN infrastructure and related activities in CANADA, 10 min
- N. Bergeot - GNSS in East Antarctica around the Princess Elisabeth Belgian base, 10 min
- AOB



Info and next steps

- SCAR OSC 2016
- 1st Antarctic & Southern Ocean Science Horizon Scan- Open questions
- GRAPE ambition toward SRP
 - (first run deadline September 2015; last run deadline December 2015; SRP full proposal April 2016)



A screenshot of the SCAR 2016 website. At the top left is the SCAR logo for the XXXIV meeting in Kuala Lumpur, 19-31 August 2016. To its right is a countdown timer for the XXXIV SCAR Biennial Meetings including the 2016 Open Science Conference, showing 461 days, 17 hours, 52 minutes, and 16 seconds. Below the logo and timer are navigation links: ABOUT, REGISTRATION, ACCOMMODATION, CONTACT, HOME, LATEST, ABOUT SCAR, THEME (highlighted), ORGANISER AND SUPPORTER, KEY DATES, INFO NOTES, and VISA. The main content area shows the breadcrumb "XXIV SCAR 2016 / THEME" and the heading "Theme". Below this is a large banner image with the text "Antartica in the Global Earth System : From the Poles to the Tropics". The banner image is a collage: on the left, a snowy mountain range; in the center, the Petronas Towers in Kuala Lumpur; on the right, a lush green forest with a peacock and an orangutan.

<http://scar2016.com/open-science-conference-sessions/>.

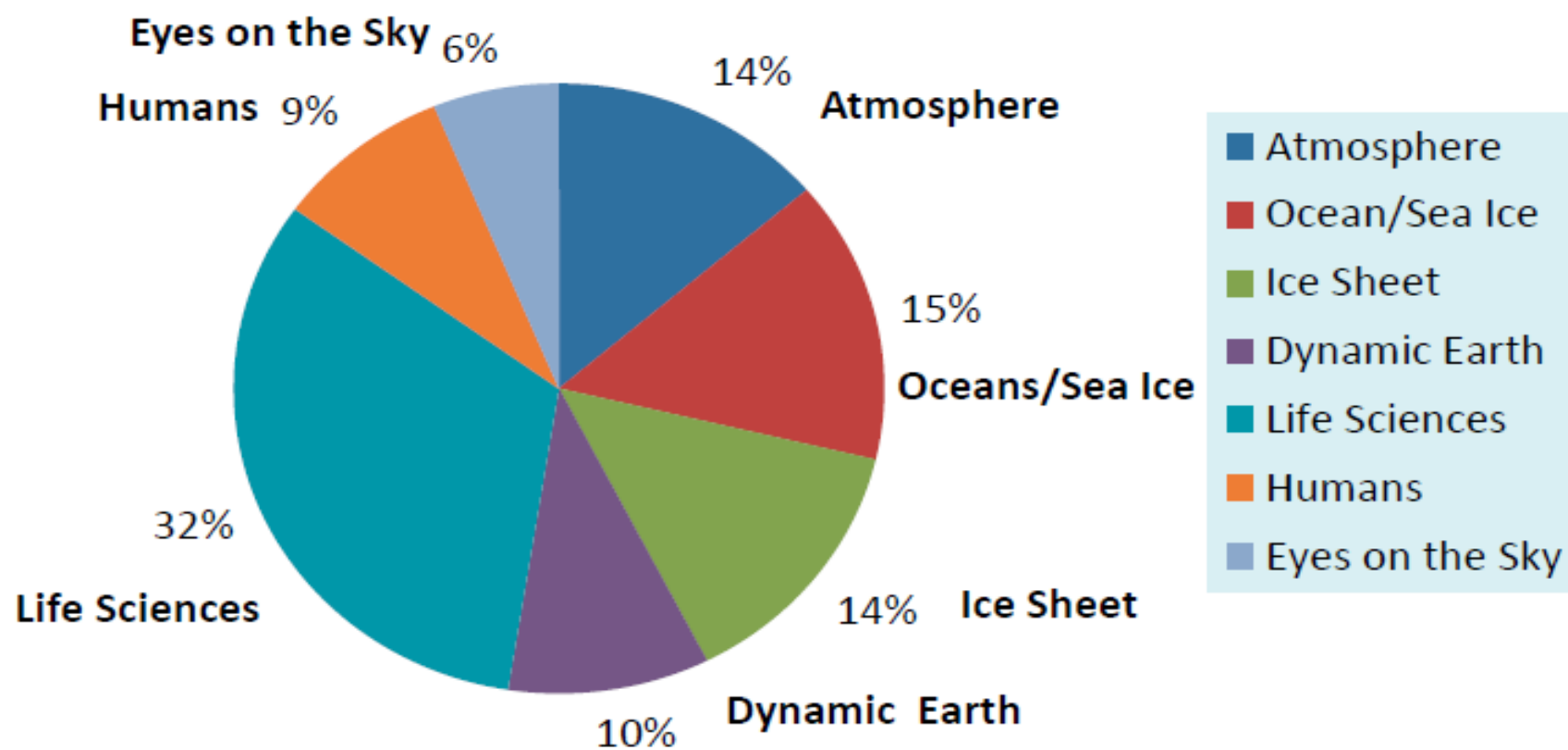
- **GRAPE session is scheduled at SCAR OSC 2016**



The 1st SCAR Antarctic and Southern Ocean Science Horizon Scan

The international Antarctic community came together to “scan the horizon” to identify the highest priority scientific questions that researchers should aspire to answer **in the next two decades and beyond.**

Cluster Topical Distribution



50% of the questions
cross-cut other topical clusters

SCIENCE PRIORITIES FOR...

DEFINE

*the global reach of the Antarctic
atmosphere and Southern Ocean*



Stieg et al 2009

UNDERSTAND

*how, where and why ice
sheets lose mass*



REVEAL

*Antarctica's
history*



LEARN

*how Antarctic life
evolved and*

RECOGNIZE AND MITIGATE

human influences



OBSERVE

space and the Universe

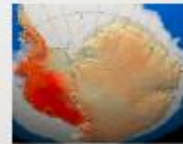


Antarctic
and
Southern
Ocean science

**THE
CHALLENGE...**

**SUSTAIN
STABLE FUNDING**

COMMUNICATE
with all stakeholders



Stieg et al 2009

PROVIDE ACCESS

*Region-wide
Year-round*



**ENHANCE
INTERNATIONAL
COOPERATION**



**APPLY EMERGING
TECHNOLOGIES**

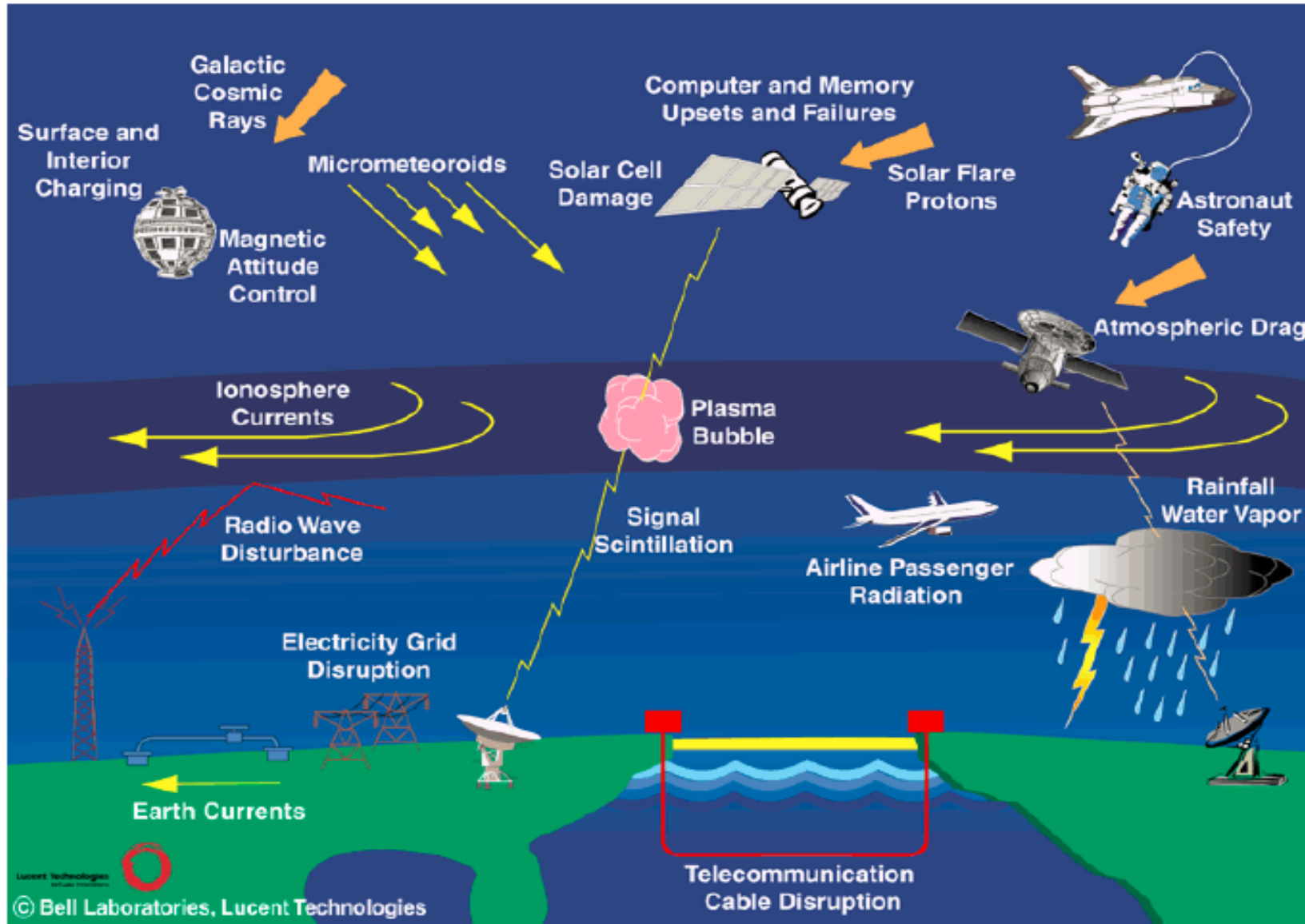


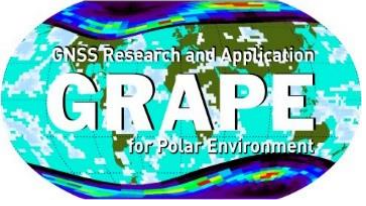
**STRENGTHEN
ENVIRONMENTAL
PROTECTION**



**Realizing
the promise of
Antarctic
science**

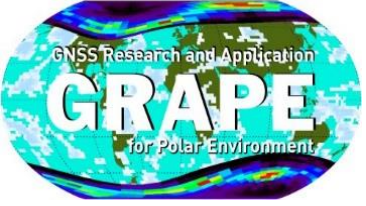
Question #72. How does space weather influence the polar ionosphere and what are the wider implications for the global atmosphere?





1st Antarctic & Southern Ocean Science Horizon Scan - Near Earth Space and Beyond- Main Open questions of interest to GRAPE

- Concerning interhemispheric differences in Earth's magnetic field geometry and the plasma processes that are guided by this field, what aspects of the solar wind control the topology? What processes within the magnetosphere (i.e., mass loading) are important in determining its response?
- What are actual interactions between neutral atmosphere and plasma in the upper atmosphere, especially during a magnetic storm? How do these affect the middle and lower atmosphere?
- Does Space Weather have a significant effect on Antarctic Climate?
- Do traveling ionospheric disturbances (TIDs) and traveling atmospheric disturbances (TADs) exhibit similar or asymmetric behaviors during geomagnetic storms?
- Do we understand the morphology of ionospheric scintillation in Antarctic that operationally degrade High Frequency communication and the use of GPS navigation?



GRAPE-Financial support requested (SSG PS and GS)

Year	Meeting Organization (\$)	Publications (\$)	Web (\$)	Participation to conferences (\$)
2015	3000 (SSG GS)		1500* (SSG PS)	
2016		1000 (SSG GS)		3000 (SSG PS)
2017	3000		1500*	
2018				3000
Total	16000\$			

*(Updating/maintenance)

The list of open questions included in THEME 6 follows, available on SCAR web



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on Antarctic Research

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1st Antarctic & Southern Ocean Science Horizon Scan



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Questions for discussion at the Retreat

An important decision in organizing the Antarctic and Southern Ocean Science Horizon Scan was grouping the scientific questions submitted by the community into a logical structure. More than 850 questions were submitted by the community and this database will be the starting point for discussion at the Horizon Scan Retreat in April 2104. The final structure of the question database is organized into eleven themes. Questions that could be logically addressed in more than one theme are repeated in the database for a total of nearly 1000 questions.

Topic No.	Theme Title
1	 Southern Ocean Physics, Geology, and Chemistry
2	 Southern Ocean Life and Ecology
3	 The Solid Earth
4	 Atmospheric Science
5	 Land Ice
6	 Near Earth Space and Beyond
7	 Biotic Responses to Change
8	 Marine Biosphere and the Physical Environment
9	 Humankind
10	 The Past - A Window on the Future
11	 Terrestrial Life and Ecology

1st Antarctic & Southern Ocean Science Horizon Scan- Near Earth Space and Beyond- LIST of Open Questions

What is the explanation of the asymmetries in energy propagation from the magnetosphere to the two polar ionospheric regions ?

How can magnetic field observations from the coast of Antarctica be use to augment the northern Geomagnetic Auroral Electrojet (AE) indices at the time when the North Atlantic is near midnight?

How often are substorms observed in only one hemisphere and what causes this to happen?

What is the energy spectrum of solar particle events?

Do we understand the morphology of ionospheric scintillation in Antarctic that operationally degrade High Frequency communication and the use of GPS navigation?

Do we understand the dynamics of small-scale irregularities leading to degradation of positioning by GNSS (Global Navigation Satellite Systems) at high latitudes?

Would it be feasible to deploy a large array of radio telescopes in Antarctica for space research?

Does Space Weather have a significant effect on Antarctic Climate?

Are we able to organize and optimize the existing experimental facilities and expertise in the field of ground-based ionospheric monitoring networks in Antarctica?

How do the aurora and polar ionosphere respond differently between both hemispheres to the transient and long-term variation of the solar wind and magnetospheric condition?

Is the electromagnetic coupling to space equal in the two polar caps?

1st Antarctic & Southern Ocean Science Horizon Scan- Near Earth Space and Beyond- LIST of Open Questions

What are the mechanisms behind the interactions between cosmic and solar radiation, the Earth's magnetic field and ozone layer depletion?

Do traveling ionospheric disturbances (TIDs) and traveling atmospheric disturbances (TADs) exhibit similar or asymmetric behaviors during geomagnetic storms?

What are the inter-hemispheric differences in the polar cap ionosphere thermosphere dynamics?

In what way do Earth's radiation belts depend on solar activity, and the solar wind in particular?

What effect does aurora have on the upper atmosphere and ionosphere? What can aurora tell us about large-scale processes in Sun-Earth coupling and their evolution?

With regard to magnetic storms, how do energetic particles drive extreme effects in the relatively accessible regions of the polar cap?

How will the polar space-atmosphere-interaction region (SAIR) change due to global climate change and what is the impact of those changes on the lower atmosphere?

Concerning interhemispheric differences in Earth's magnetic field geometry and the plasma processes that are guided by this field, what aspects of the solar wind control the topology? What processes within the magnetosphere (i.e., mass loading) are important in determining its response?

Can the asymmetry in ULF wave power in ionospheric content between the two hemispheres be explained?

What are actual interactions between neutral atmosphere and plasma in the upper atmosphere, especially during a magnetic storm? How do these affect the middle and lower atmosphere?

Can we explain the asymmetric nature of substorms, both in onset time and strength, and local time?