



GRAPE

“GNSS Research and Application for Polar Environment”

A joint SCAR PSG and GSG Expert Group

*Chief Officer: Giorgiana De Franceschi, Istituto Nazionale di Geofisica e Vulcanologia,
Deputy Chief Officer: Nicolas Bergeot, Royal Observatory of Belgium*

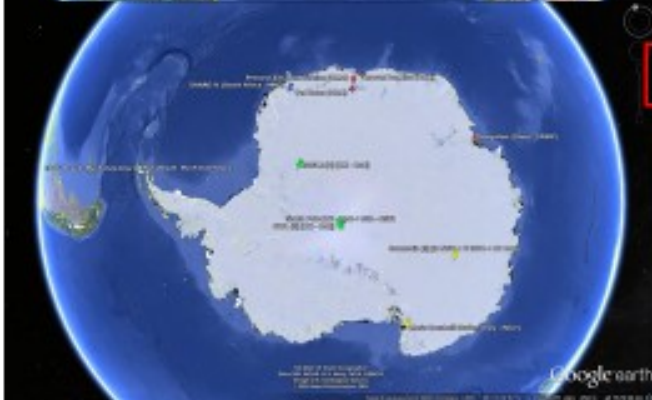


GRAPE main objective: intensify the **international efforts** to build and coordinate a robust network of collaborations able to **answer a variety of weather and space weather related needs** through ad hoc **data sharing and model development.**

NETWORK AND DATA



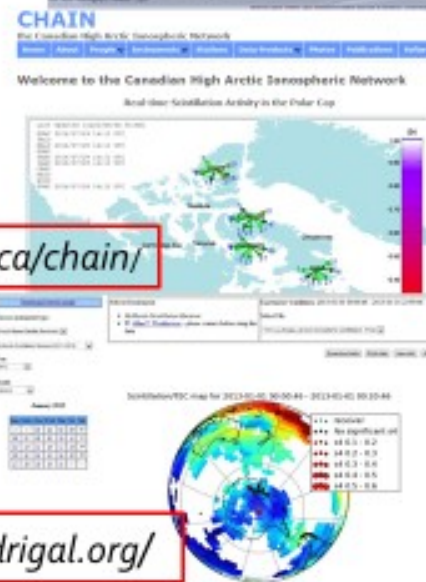
GNSS network – Northern and Southern Hemisphere



www.eswua.ingv.it

<http://chain.physics.unb.ca/chain/>

<http://cedar.openmadrigal.org/>



THE WEB! WWW.GRAPE.SCAR.ORG

GRAPE
GNSS Research and Application for Polar Environment
is a SCAR Expert Group since 2012

Claudio Cesaroni 2013

Chief Officer: *Giorgiana De Franceschi* (e-mail: giorgiana.defranceschi@ingv.it)
Deputy Chief Officer: *Nicolas Bergeot* (e-mail: nicolas.bergeot@oma.be)



GRAPE 2012-2018 RESULTS

- **Publications** (full list at www.grape.scar.org) > **60 papers and a special issue on Annals of Geophysics**
- **SCAR reports 2012-2018**
- **Conferences, Workshops, Training and capacity building:**

SCAR OSC 2012, 2014, 2016, 2018 (side meetings + scientific sessions)

URSI AT RASC 2015

BSS, 2016

URSI GASS 2017

1 DAY MEETING AT ROB, 2017

25 Phd students from:

EUROPE, ASIA, AFRICA, S. AMERICA

CONSORZIO INTERUNIVERSITARIO PER LA FISICA SPAZIALE

GRAN SASSO SCIENCE INSTITUTE

AGENZIA SPAZIALE ITALIANA

UNIVERSITA' DEGLI STUDI DELL'AQUILA

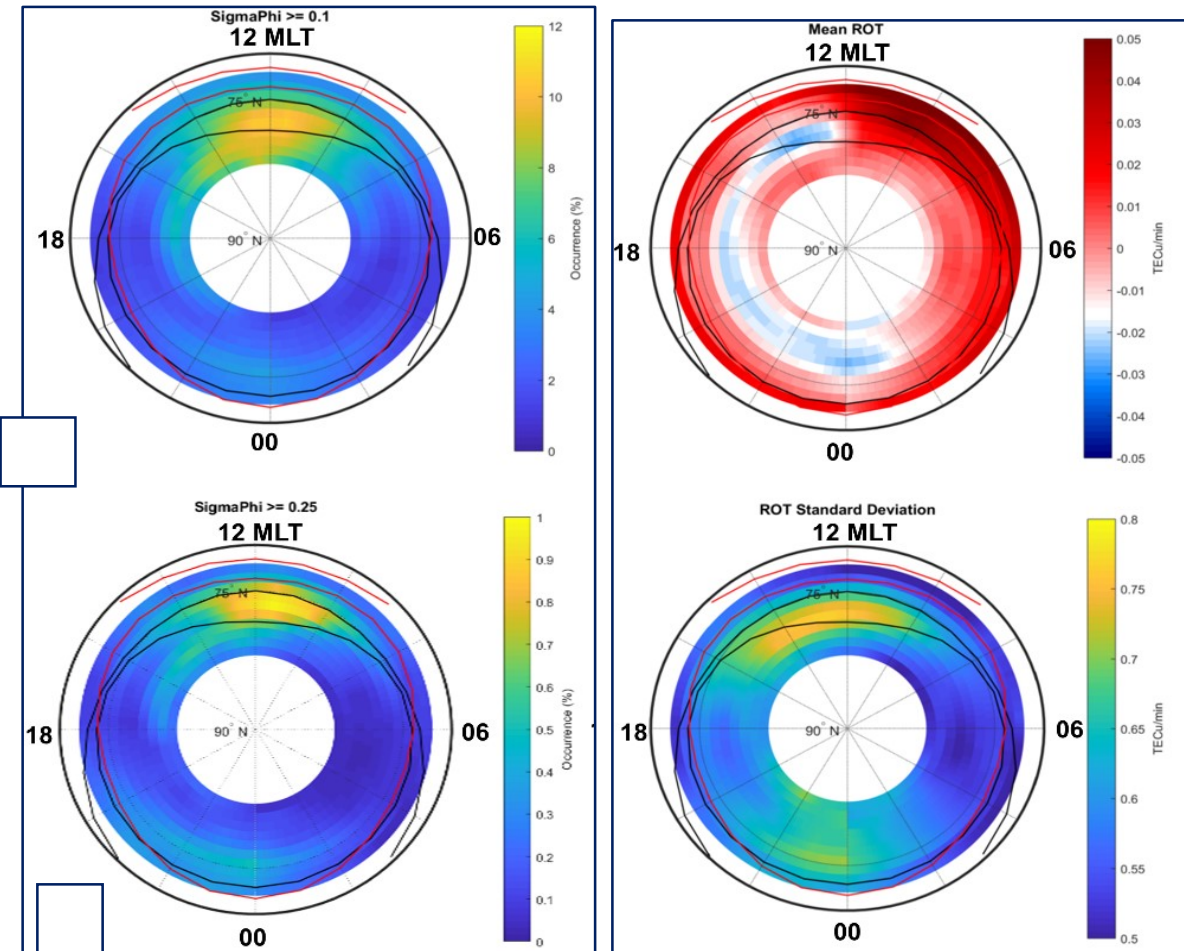
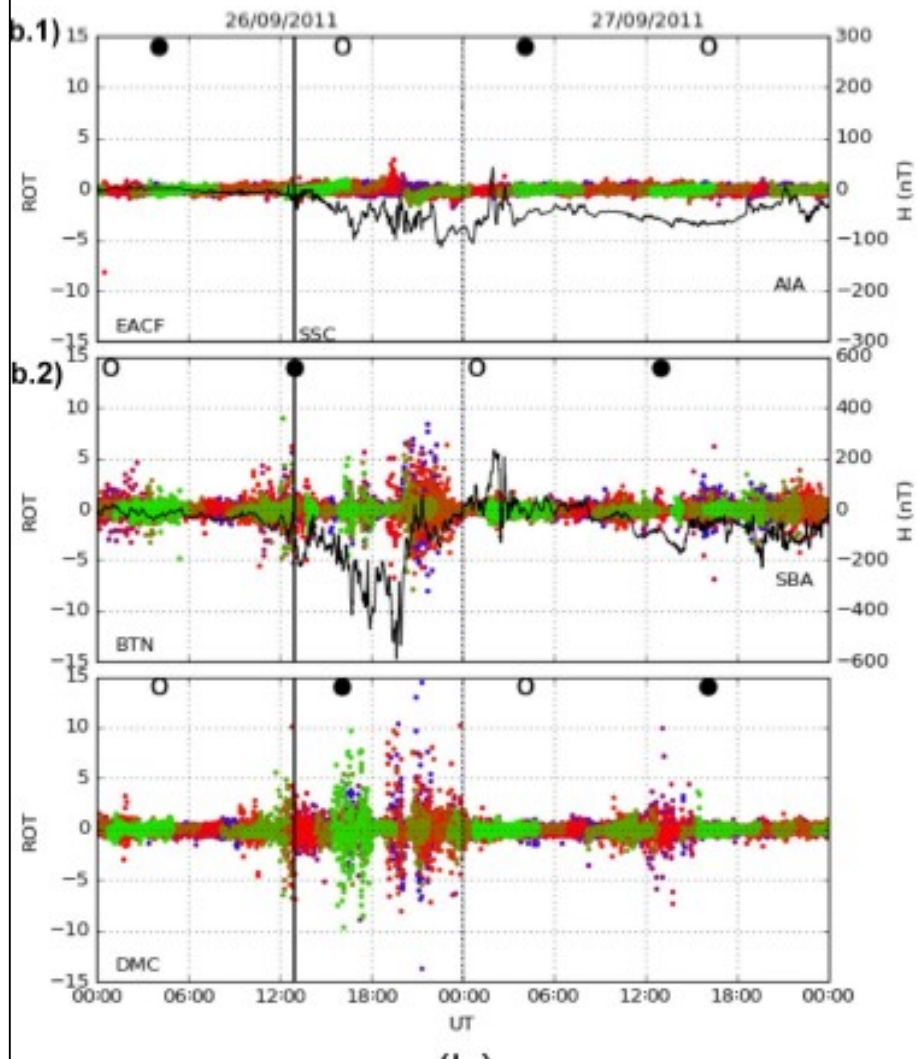
INTERNATIONAL SCHOOL OF SPACE SCIENCE
L'Aquila - ITALY

THE POLAR UPPER ATMOSPHERE: FROM SCIENCE TO OPERATIONAL ISSUES

17-21 September 2018, L'Aquila (Italy)

EGU Sponsored School

GRAPE HIGHLIGHTS



TEC variability (ROT) during a SSC at different sector (American sector (b.1) and in the Australian sector (b.2). The vertical thick line marks the time of the SSC, 26 Sept. 2011. Correia et al., 2017

**Ionospheric scintillation climatology
Ny-Ålesund across solar cycles 23/24
De Franceschi et al., 2018 submitted**



GRAPE future activities

- **Maintain and improve the experimental infrastructures**
 - **Encouraging multi-instrument approaches to investigate the neutral and ionized atmosphere**
 - **Develop data management strategies and algorithms (ICT) to combine data from different sources**
 - **Disseminate the results (SCAR reports, conferences, publications, web, education, outreach)**
-
- **Support the new SCAR SRP proposal «RESOURCE».**

RESOURCE

Radio Sciences Research on AntarctiC AtmospherE

RESOURCE aspires to be a new scientific research programme. A task force has been established in 2015 within and outside GRAPE to implement the proposal, submitted to SCAR in 2017.

RESOURCE wishes to represent:

- the need of the scientists that **investigate the atmosphere** by means of radio observation,
- the requirement of the scientists that want **to remove or to mitigate the atmospheric noise** from their radio measurements.

Join us!

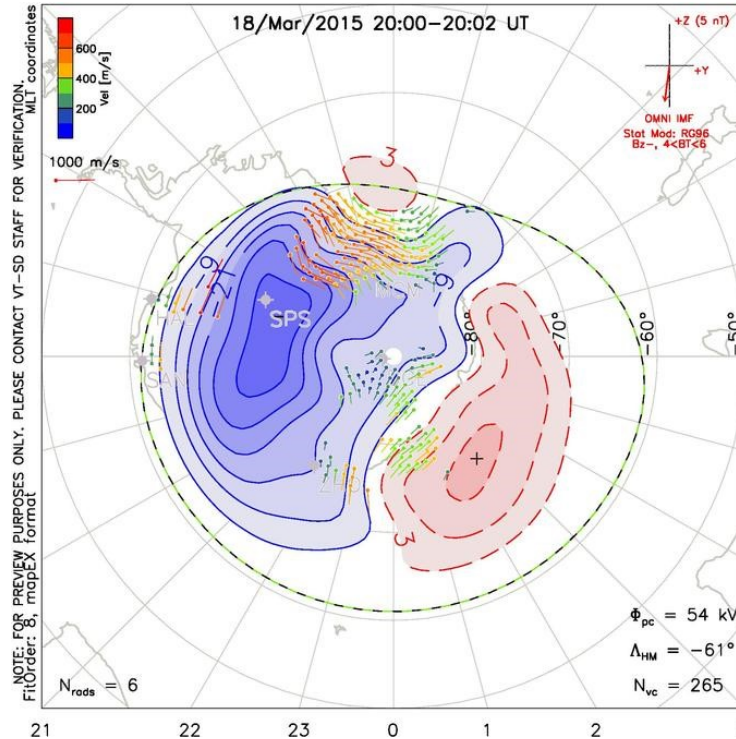
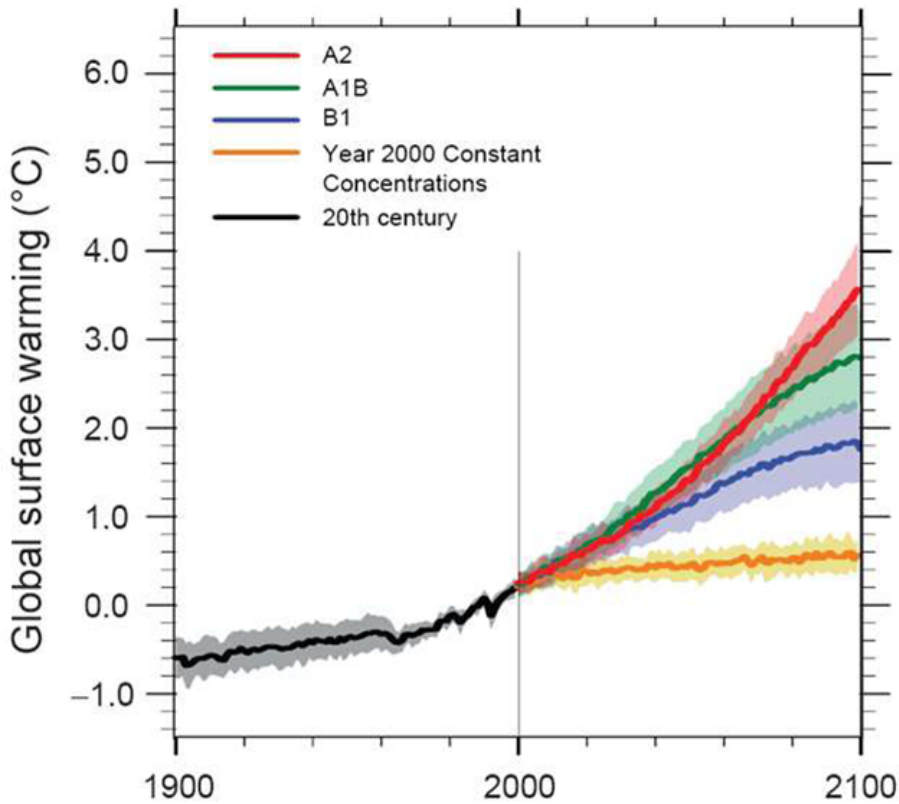
lucilla.alfonsi@ingv.it
nicolas.bergeot@oma.be



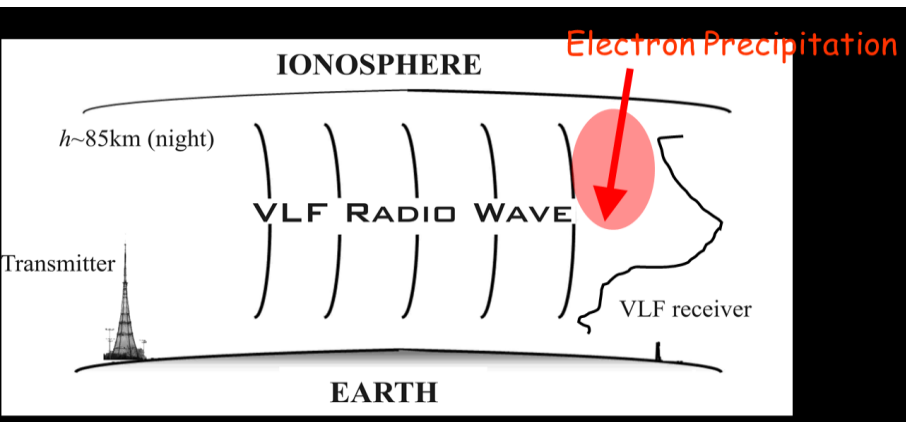
RESOURCE OPPORTUNITIES

INVESTIGATE THE ATMOSPHERE BY RADIO OBSERVATIONS

Thanks to the remote sensing of Precipitable Water Vapor (PWV) it is possible to derive projections of surface warming to assess the **Global Change**. The example refer to projections till to 2100. **A2 high economic growth (GHG correlated)**, **A1B moderate growth** **B1 low growth**.

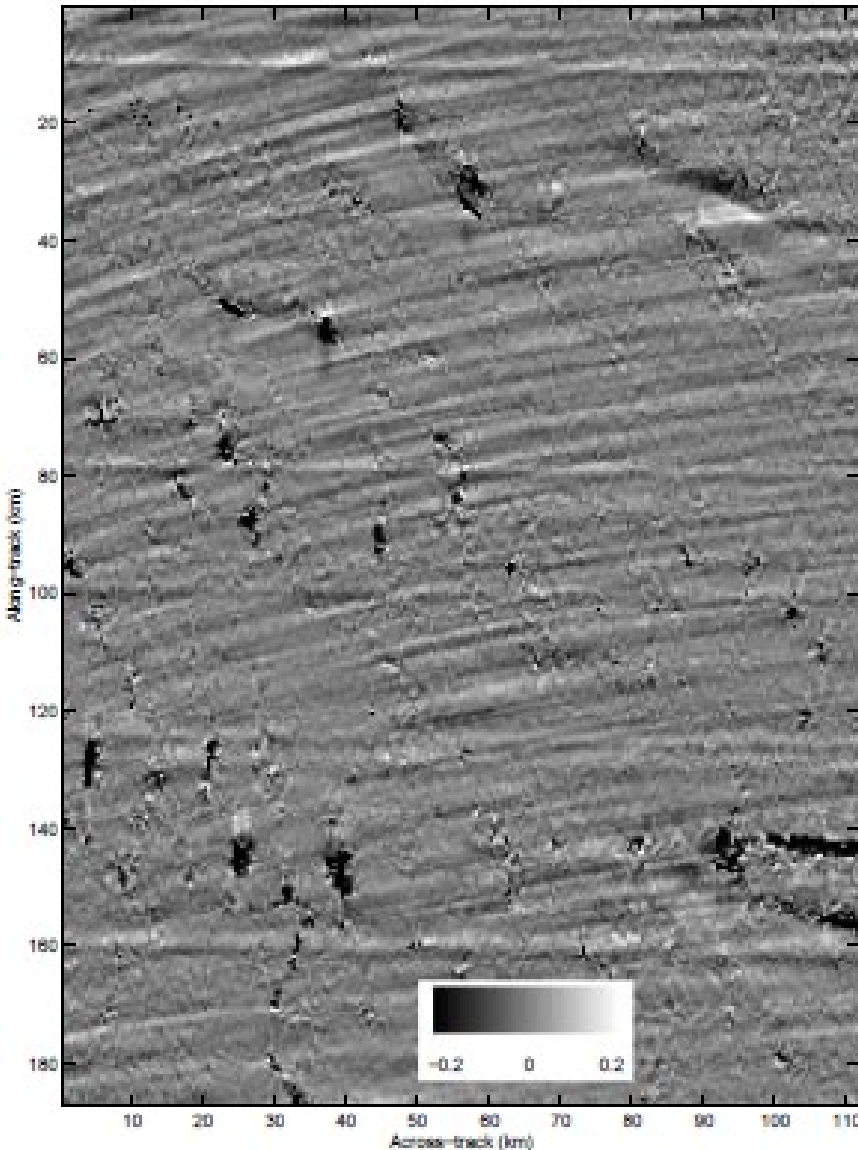


INVESTIGATE THE IONOSPHERE BY RADIO OBSERVATIONS- SuperDARN



INVESTIGATE THE IONOSPHERE BY RADIO OBSERVATIONS VLF wave observations- AARDDVARK: Subionospheric Radio Wave Propagation

RESOURCE OPPORTUNITY



INVESTIGATE THE IMPACT OF THE IONOSPHERE ON SYNTHETIC APERTURE RADAR - Ionospheric propagation effects cause significant distortions in the data of low-frequency synthetic aperture radar (SAR) systems, whose severity is increasing with decreasing system frequency.

C-band **azimuth streaks** from part of a RADARSAT Antarctic satellite radar interferometry **due to auroral ionospheric disturbances**. Gray et al., Geophysical Research Letters 27, no. 10 (2000): 1451-1454.



ALLOCATED BY GEOSCIENCE AND PHYSICAL SCIENCE GROUPS

Summary Budget 2017 to 2020

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	1986	2162	2000	2000

Summary Budget 2017 to 2020

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	4021	2500	2500	2500

2018 funds have been used to cover 3 POLAR2018 registrations fees for experts and 2 POLAR2018 registration fees for PhD students/ECR. Remaining funds (1500USD) will cover the travel expenditures of one PhD student from SA attending the POLAR UPPER ATMOSPHERE SCHOOL at L'Aquila, IT, Sept 2018.



KUALA LUMPUR 2016



THANKS

WWW.GRAPE.SCAR.ORG