

“GNSS Research and Application for Polar Environment” (GRAPE)

A joint SSG PS and GS Expert Group

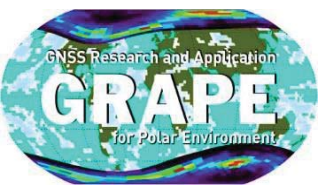
Giorgiana De Franceschi, Istituto Nazionale di Geofisica e Vulcanologia, giorgiana.defranceschi@ingv.it

XXXIII



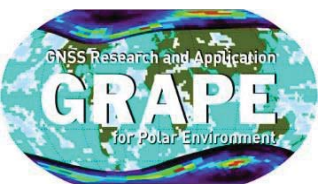
Auckland, NZ, 25-28 August, 2014





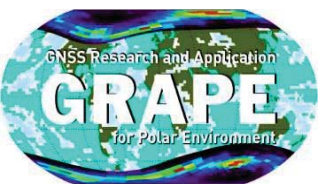
GRAPE main objectives:

- Create and maintain distributed **networks** of specialized **GPS/GNSS** Ionospheric Scintillation and TEC Monitors
- Identify and quantify mechanisms that cause **scintillation** and control **interhemispheric** differences, asymmetries and commonalities
- Develop **ionospheric** scintillation climatology, tracking and mitigation **models** to improve prediction capabilities of **space weather**.
- Retrieve **tropospheric PWV** for input to **weather forecast** models and to develop **regional PWV climatology** for atmospheric sensing in remote areas.



GRAPE structure

- **WG1**- Solar-Terrestrial interactions and ionospheric effects in the current solar-cycle
(chair: Paul Prikryl- Canada, co-chair: Emilia Correia- Brazil)
- **WG2**-Lower atmosphere delay in GNSS based systems
(chair: Monia Negusini – Italy)
- **WG3**- Modelling and models testing
(chair: Cathryn Mitchell UK, co-chair Marcin Grzesiak, Poland)
- **WG4**- GNSS Data management strategy.
(chair: Vincenzo Romano-Italy, co-chair: Pierre Cilliers-South Africa)
- **WG5**-Coordination with other programs inside and outside SCAR
(chair: Maurizio Candidi Italy)



GRAPE 2012-2014 RESULTS (1/2)

- **WEB** www.grape.scar.org , contribution to www.scar.org pages
- **Outreaches** –INGV

GRAPE - Windows Internet Explorer

http://ionos.ingv.it/grape_new/index.html

GRAPE

GNSS Research and Application for Polar Environment

HOME PAGE PARTICIPANTS WORK PACKAGES INFRASTRUCTURES

CONFERENCES RESOURCES DATA JOIN US!

Welcome to GRAPE

GRAPE (GNSS Research and Application for Polar Environment) is a joint GeoSciences and Physical Sciences Expert Group lasting from 2012 to 2015.
Contact: Giordiana De Franceschi (e-mail: giordiana.defranceschi@ingv.it).

The International Polar Year (IPY) and International Heliophysical Year (IHY) initiatives left an important heritage in terms of data sharing, expertise exchange and increasing awareness of the current scientific capabilities. In particular, the GWSWF SCAR Action Group took advantage of the Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR) and the Polar Earth Observing Network (POLENET) experiences that lead to creation of working groups on specific themes such as the use of geodetic data to study weather and space weather events. The multidisciplinary approach of IPY is the key in overcoming relevant difficulties, above all, the poor coverage of Antarctica. GRAPE Expert group intend to continue to follow this route, intensifying the efforts to build a robust network of collaborations in order to answer a variety of space weather related needs through ad hoc data sharing and model development.

Main Objectives

- Create and maintain distributed networks of specialized GPS/GNSS Ionospheric Scintillation and TEC Monitors particularly at high latitudes.
- Identify and quantify mechanisms that cause scintillation and control interhemispheric differences, asymmetries and commonalities in scintillation occurrence and intensity as a result of the geospace environment conditions.
- Develop ionospheric scintillation climatology, tracking and mitigation models to improve prediction capabilities of space weather.
- Retrieve tropospheric PWV for input to weather forecast models and to develop regional PWV climatology for atmospheric sensing in remote areas.

SCAR

26 | 31 MARZO 2012 SCIENZAPERTA

INCONTRI CON IL PIANETA TERRA

ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA

Con SCIENZAPERTA l'INGV si propone di aprire al pubblico le proprie Sedi per mostrare i luoghi della ricerca scientifica, offrire eventi, percorsi e visite guidate. In ogni sede si avvieranno programmi scientifici con l'obiettivo comune di incuriosire, interessare ed emozionare il pubblico, per presentare la ricerca come patrimonio di tutti. "La scienza aumenta quando la si distribuisce" Guglielmo di Champaux

coordinamento scientifico Giuliana D'Addezio | INGV

L'Istituto Nazionale di Geofisica e Vulcanologia per l'edizione 2012 di ScienzaAperta organizza un ricco programma di iniziative di comunicazione rivolte al grande pubblico per diffondere la conoscenza scientifica, creare curiosità attorno al mondo della ricerca, raccontare le scoperte scientifiche e dialogare con la comunità. L'obiettivo è quello di accrescere la percezione dell'importanza delle Scienze della Terra nell'ambito delle attività e del radicamento nella società.

SCENZIAPERTA

PROGRAMMA della SEDE di ROMA

29 MARZO
giovedì

09.30 | 12.30
Percorsi didattici per le scuole

20.00 | 22.00
Incontro scientifico-Concerto
"Viaggio musicale tra i terremoti italiani"
Nora Figgies voce, tamburello
Massimiliano Felice, organetto
Marta Ricci, voce, chitarra, tamburello

30 MARZO
venerdì

09.30 | 12.30
Percorsi didattici per le scuole

20.00 | 22.00
Incontro scientifico-Concerto
"Onde, simpatia e musica"
"Il Coro dell'Angelo"
direttore Antonino D'Amico
Incontro con i ricercatori
Esperimenti interattivi

31 MARZO
sabato

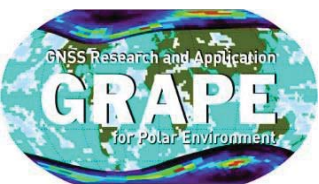
11.00 | 18.00
Laboratori aperti all'INGV

Proiezione documentario scientifico:
"Sulle tracce dei ghiacciai"
di M. Sbrilla e P. Arallo, Italia 2010
Al termine domande e risposta
con i ricercatori INGV

Sede INGV - Roma
Via di Vigna Murata 605
tel. 06 49808771 e fax 06 49808770

Formazione divulgativa scientifica

Istituto Nazionale di Geofisica e Vulcanologia



GRAPE 2012-2014 RESULTS (2/2)

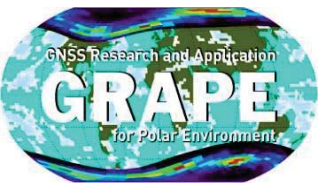
➤ **Publications** (full list at www.grape.scar.org) about 20 papers

- Grape, Solar Terrestrial Physics in an operational environment- Special Issue Annals of Geophysics Vol. 56, No2 (2013) DOI:10.4401/ag-6366 , Ed G. De Franceschi, M. Candidi,
- Papers on *JGR, JASTP, Ann. Geophys., Space Weather, Adv. in Space Res., Radio Sci., etc.*

➤ **Conferences, Meetings, Workshops**

- IPY 2012 Conference (Montreal, Canada)
- XXXII SCAR OSC 2012 (Portland, Oregon - USA)
- XXXIII SCAR OSC 2014 (Auckland, New Zealand):
 - GRAPE Oral Session 11 (Tuesday 26, 11.30-13.30-Epsom Room 2)
 - GRAPE Poster Session 11 (Monday 25 Poster Session A)
 - GRAPE Satellite Meeting (Tuesday 26, 13.45-14.45, Marlborough room 2)

(Convenors: Emilia Correia- BR, Mike Terkldisen-AU, Giorgiana De Franceschi-IT)



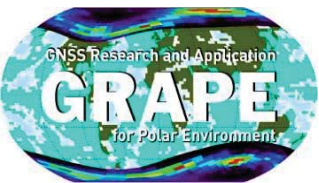
GPS network – Northern hemisphere



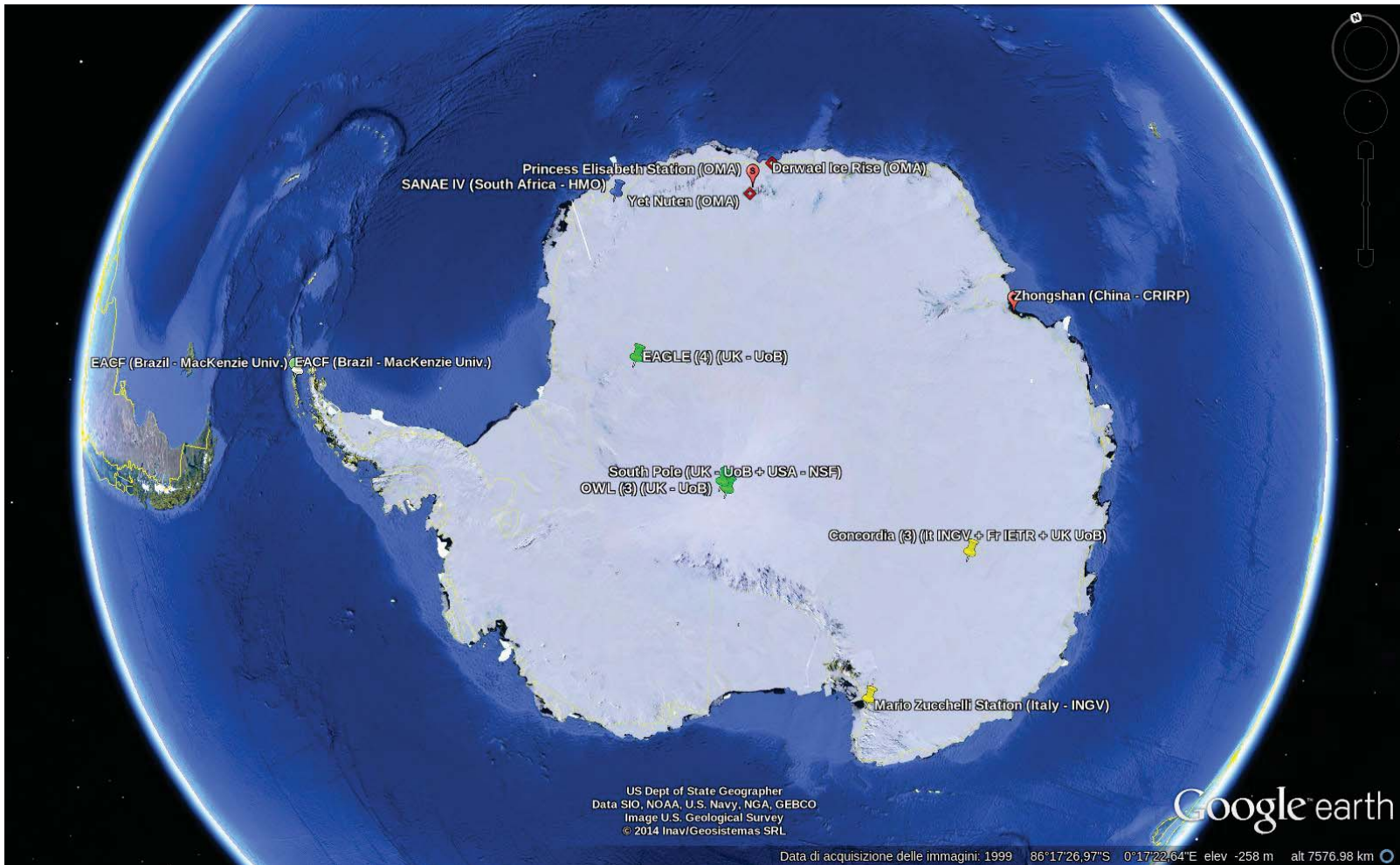

GISTM receivers


CJW-1 receiver

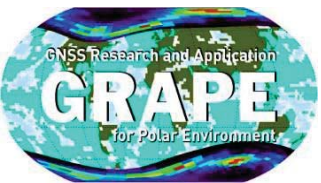

PolarXs receivers



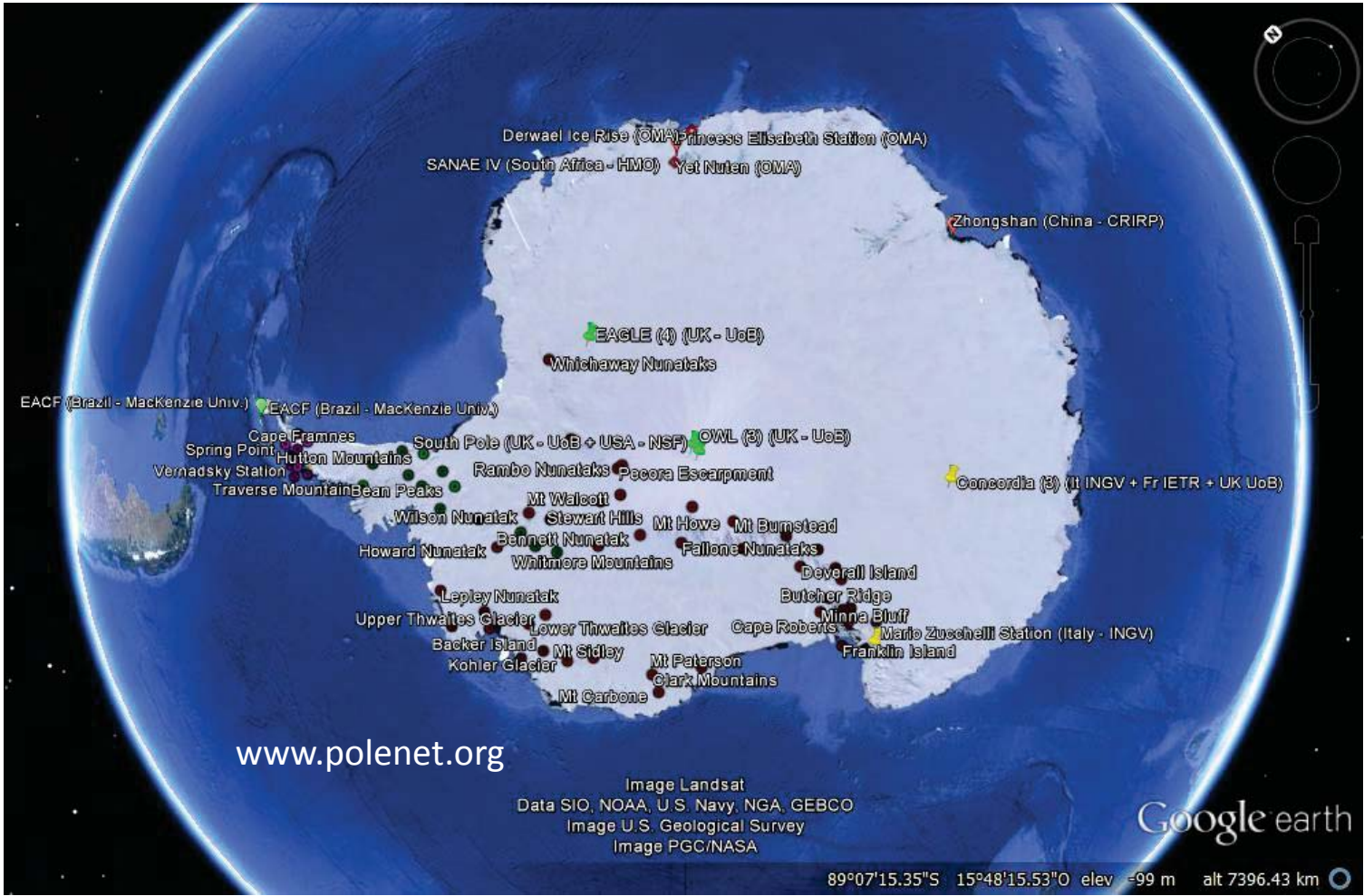
GPS network – Southern hemisphere



- GISTM receivers
- CJW-1 receiver
- Javad receiver
- Polars receivers
- Trimble receivers



GPS network – Southern hemisphere



www.polenet.org

Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image U.S. Geological Survey
Image PGC/NASA

Google earth

89°07'15.35"S 15°48'15.53"O elev -99 m alt 7396.43 km



GISTM receivers



CJW-1 receiver



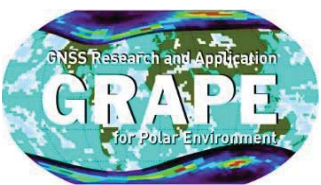
Javad receiver



PolaRxs receiver



Trimble receivers



eSWua
www.eswua.ingv.it



Madrigal home page

Selected Instrument:
 • McMurdo Scintillation Receiver
 • Pt. Alan T. Weatherux - please contact before using this data

Experiment: Scintillation: 2013-01-01 00:00:46 - 2013-01-01 23:59:46
 Select File:
 1721_3_00_gps_all_out_ionospheric_scintillation - Final

Download data | Print data | View info | Show Plot

Choose instrument type:
 Ground Based Satellite Receivers
 Ionospheric Scintillation Receiver (2011-2013)

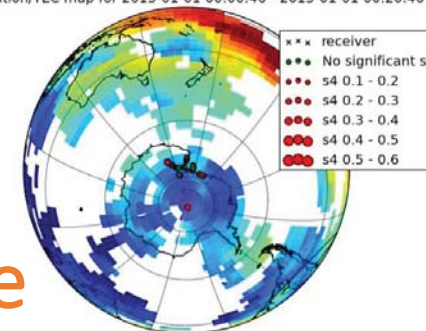
Year:
 2013

Month:
 January

January 2013

Sun	Mon	Tue	Wed	Thu	Fri	Sat
01	02	03	04	05	06	07
08	09	10	11	12		
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Scintillation/TEC map for 2013-01-01 00:00:46 - 2013-01-01 00:20:46



Madrigale

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

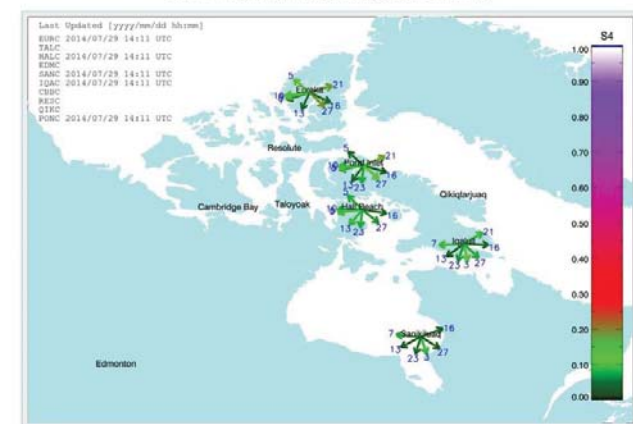
CHAIN

the Canadian High Arctic Ionspheric Network

- Home
- About
- People
- Instruments
- Stations
- Data Products
- Photos
- Publications
- Software

Welcome to the Canadian High Arctic Ionspheric Network

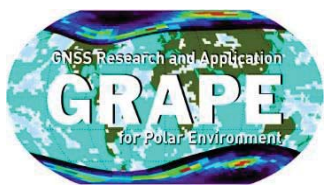
Real-time Scintillation Activity in the Polar Cap



CHAIN

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

DATA from the network are available on request;
visit the GRAPE web



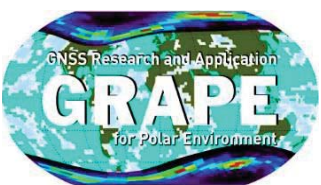
GRAPE future activities

Maintain and improve the networks

Encourage multi-instrument data approach

Disseminate the results

Contribute to one of the six priorities for Antarctic Science
(Theme: Observe space and the Universe - *Solar events impact on global communications and power systems*)

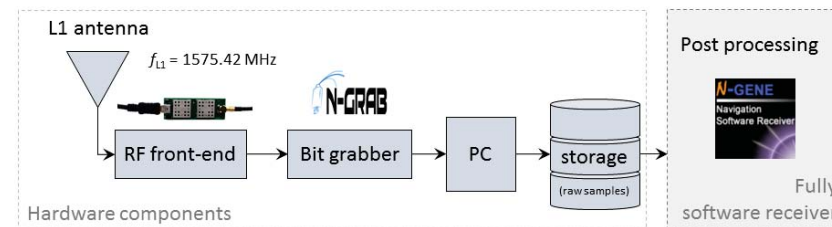
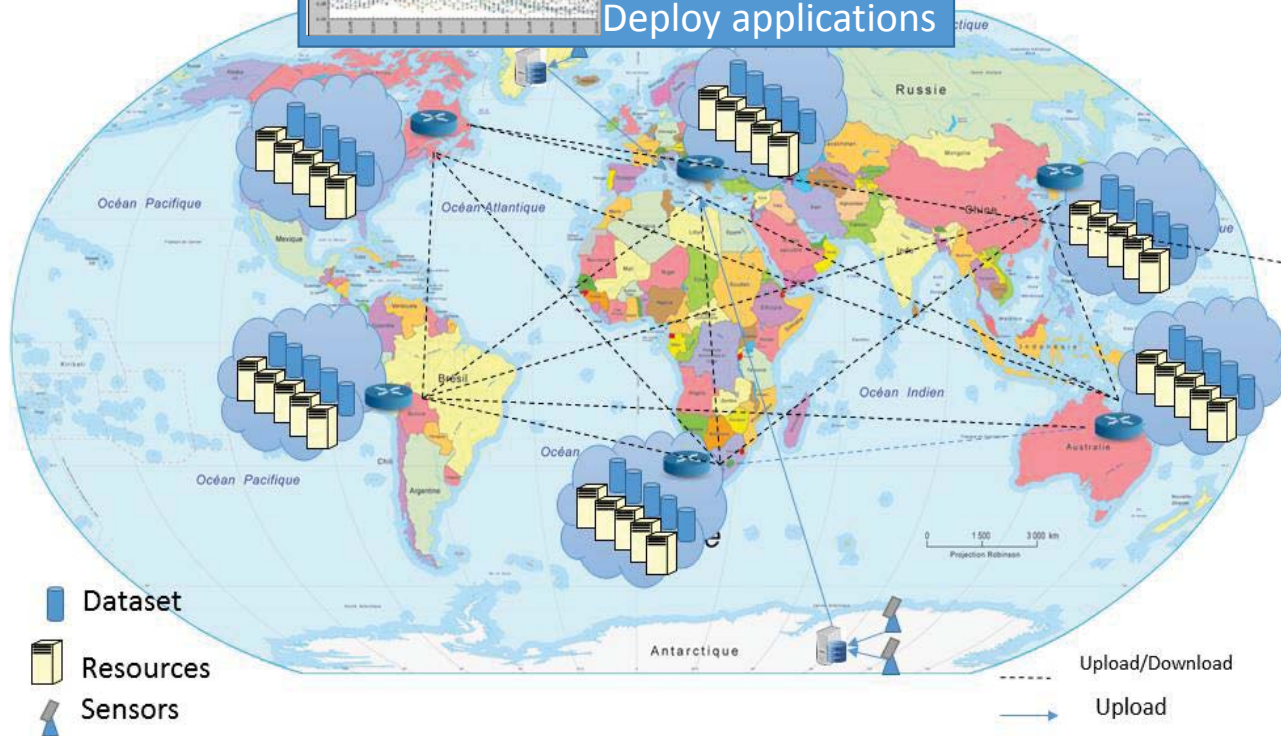


GRAPE future activities (1/2): a new initiative...

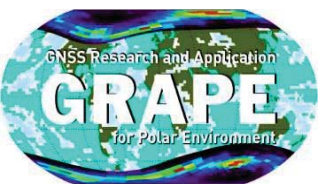
The project will realize a demonstrator, DemoGRAPE, to provide on selected case studies an empirical assessment of the delay and of the corruption induced by the ionosphere on satellite signals in the Antarctic regions. **Countries involved: Italy, South Africa and Brazil**

**DemoGRAPE-
PNRA 2014-2016**

WEB PLATFORM
Sharing data
Sharing resources
Deploy applications



- Strong potentialities offered by fully **software GNSS receivers** for scientific purposes:
 - flexibility
 - configurability
 - block structure: capability to test different algorithms

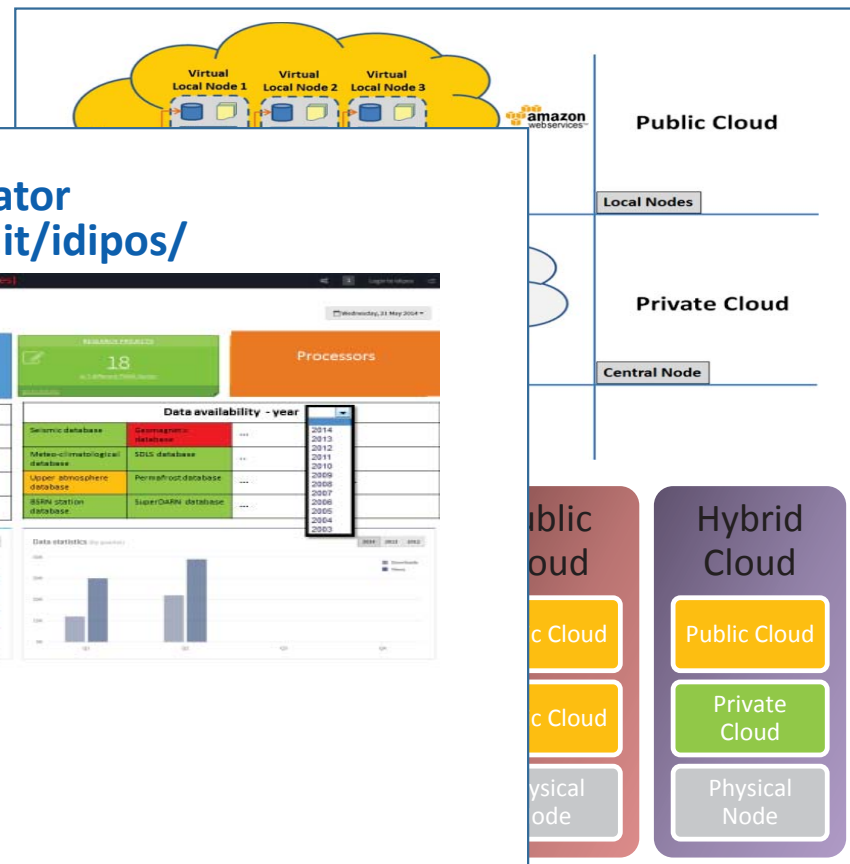


GRAPE future activities (2/2): efforts for data strategy

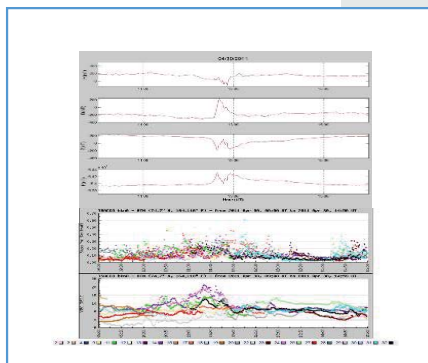
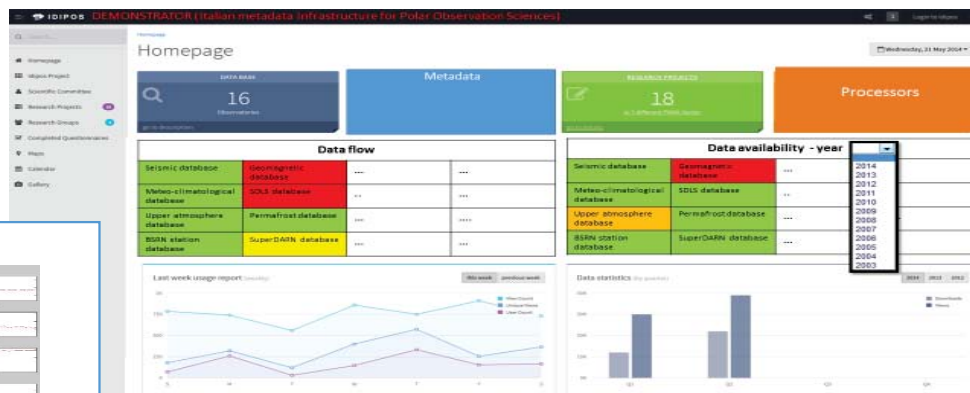
IDIPOS (PNRA): a feasibility study for an Italian Database Infrastructure for Polar Observation Sciences www.idipos.pnra.it

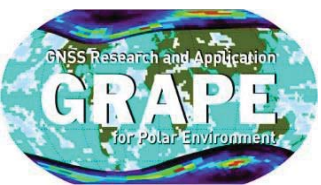
The cloud idea for IDIPOS

Infrastructure Architecture



Demonstrator
<http://www.uix.it/idipos/>

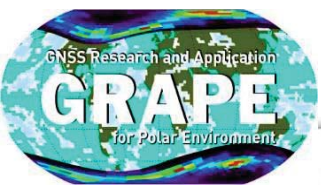




GRAPE-Financial support requested (SSG PS and GS)

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)



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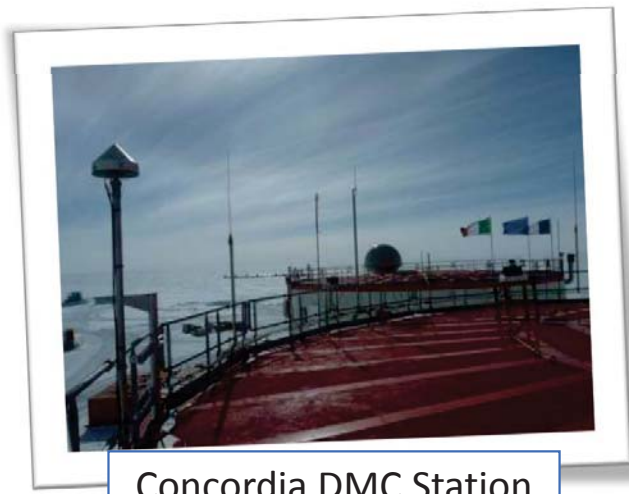
Comandante Ferraz



Yet Nuten



Mario Zucchelli Station



Concordia DMC Station