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 SIDE MEETING
17 June 2018
AGENDA

08.00-0.8.20 GRAPE state of the art, Outreach and Dissemination (G. De Franceschi, N. Bergeot, L. Alfonsi)

08.20-10.20 National projects/initiatives:

- **KOREA**- Geonhawa Jee (KOPRI)
- **JAPAN**- Yasunobu Ogawa (NIPR)
- **BRAZIL**- Emilia Correia (INPE)
- **ARGENTINA**-Adriana Gulisano (IAA/DNA)
- **BELGIUM**- Nicolas Bergeot (ROB)
- **SOUTH AFRICA**-Christel Hansen (University of Pretoria)
- **UK**- Mark Clilverd (BAS) (presented by LA-INGV)
- **CANADA**- P. T. Jayachandran (UNB)
- **USA**-Allan Weatherwax (MERRIMACK College)
- **ITALY**-Claudio Cesaroni (INGV)

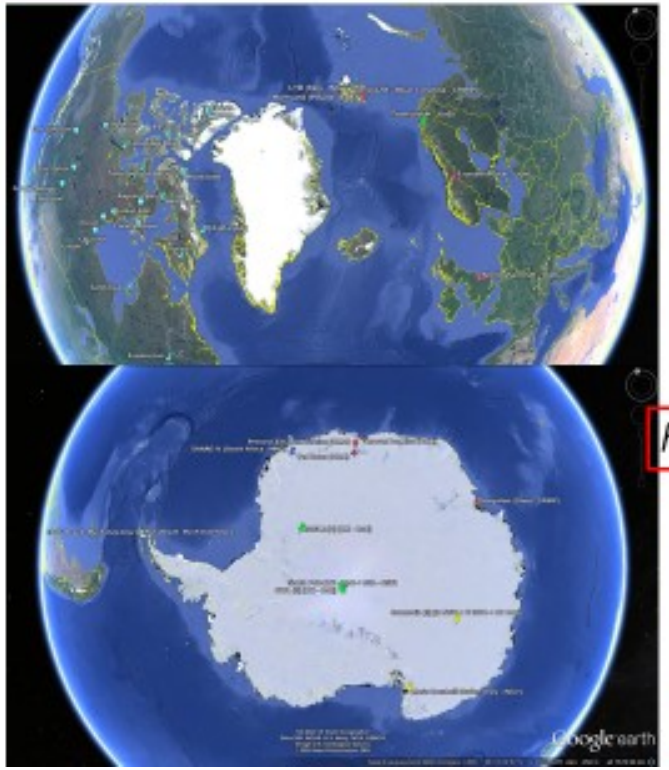
10.20-10.40 RESOURCE (L. Alfonsi, N. Bergeot)

10.40-11.00 **GRAPE next steps, open discussion, wrap-up**

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.**

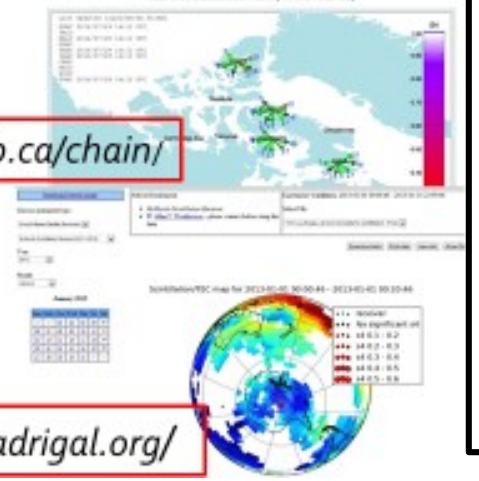
NETWROK AND DATA

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 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

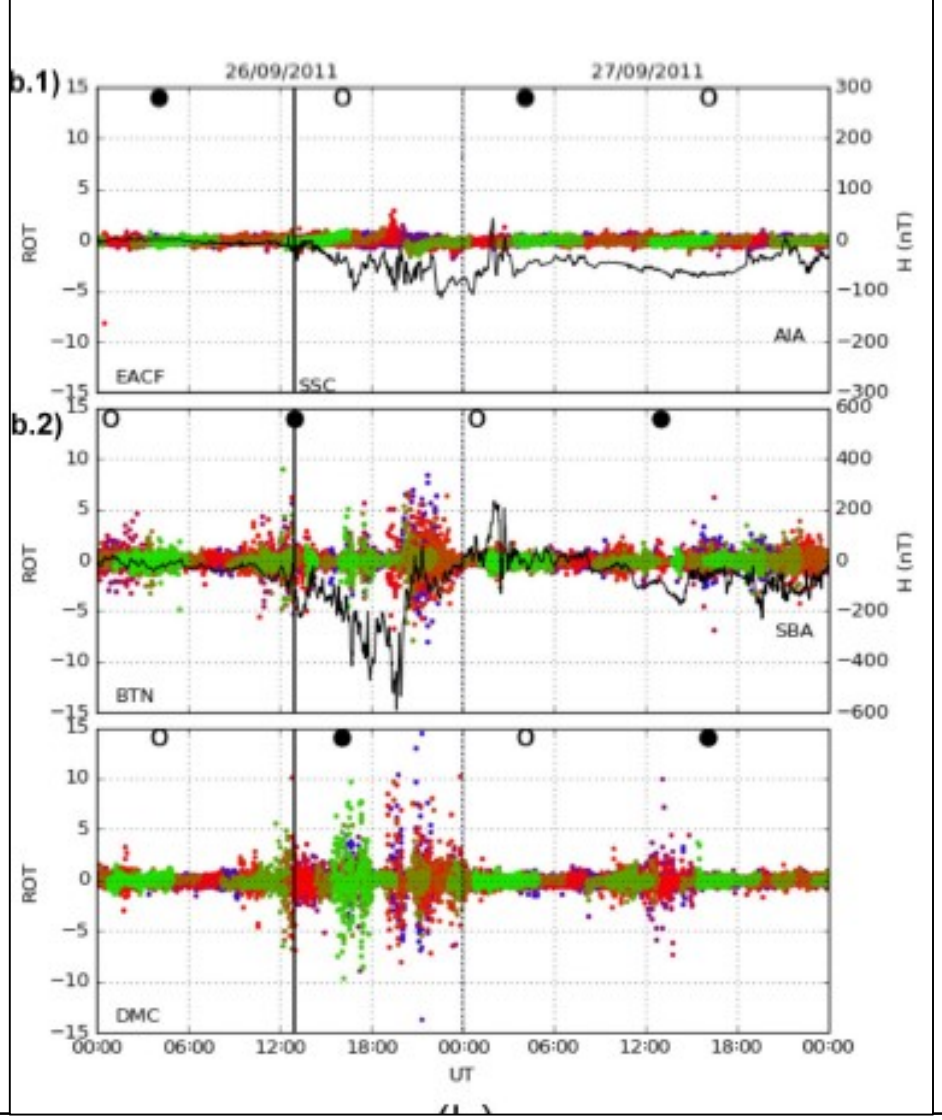
URSI GASS 2017

1 DAY MEETING AT ROB, 2017

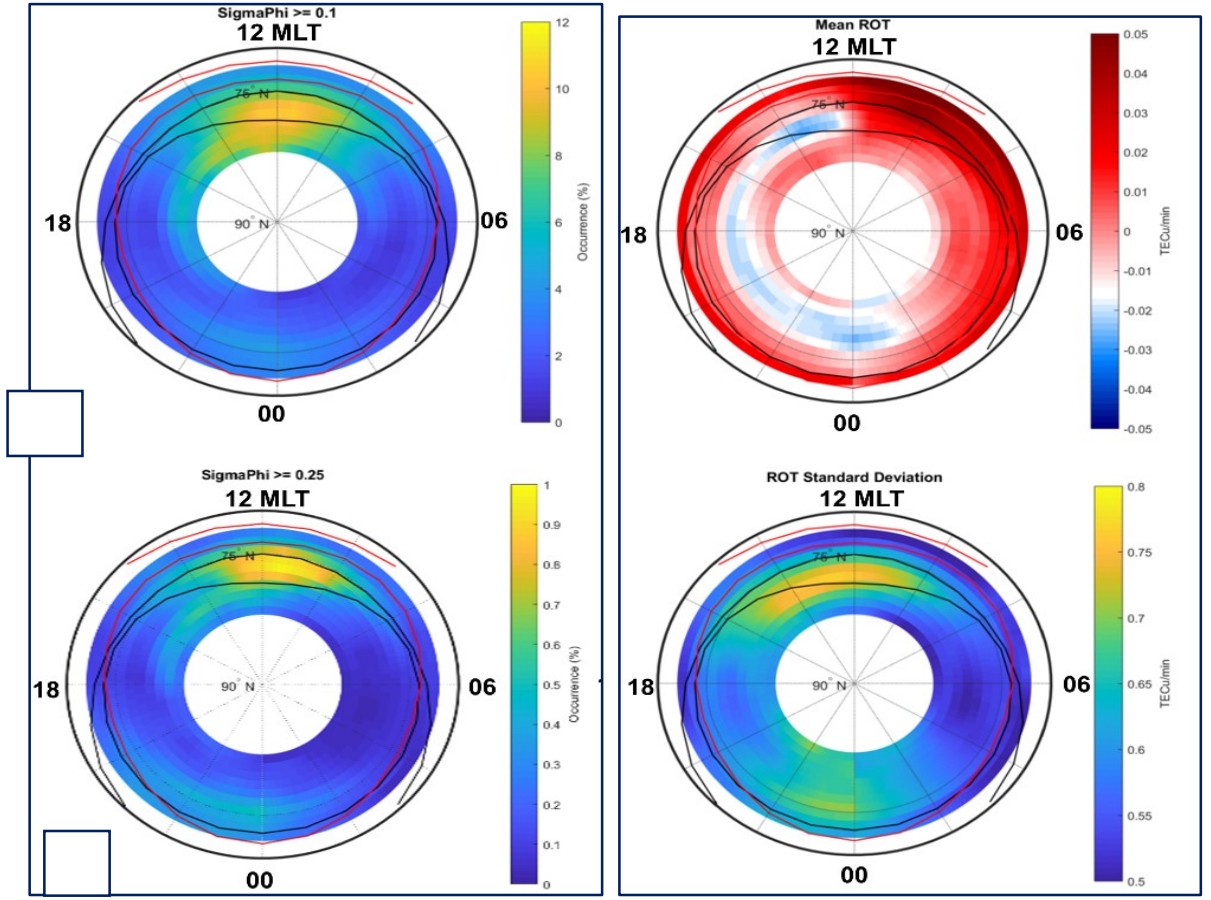
25 Phd students from:

EUROPE, ASIA, AFRICA, S. AMERICA

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 sumitted

GRAPE future activities (1/2)

- **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*
- **Maintain** and improve **the networks** of specialized GPS/GNSS Ionospheric Scintillation and TEC Monitors and **encourage multi-instrument data** approach 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».** Task force established in May 2015, proposal submitted to SCAR in 2017, expected to start in 2020.

RESOURCE
Radio Sciences Research on AntarctiC AtmospherE

Scientific Committee of Antarctic Research (SCAR) Expert Group GRAPE (GNSS Research and Application for Polar Environment, http://www.grape.scar.org/)

Resource is a new scientific research programme: RESOURCE (Radio Sciences Research on AntarctiC AtmospherE).

RESOURCE wish 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!

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UK report: Mark Clilverd, British Antarctic Survey

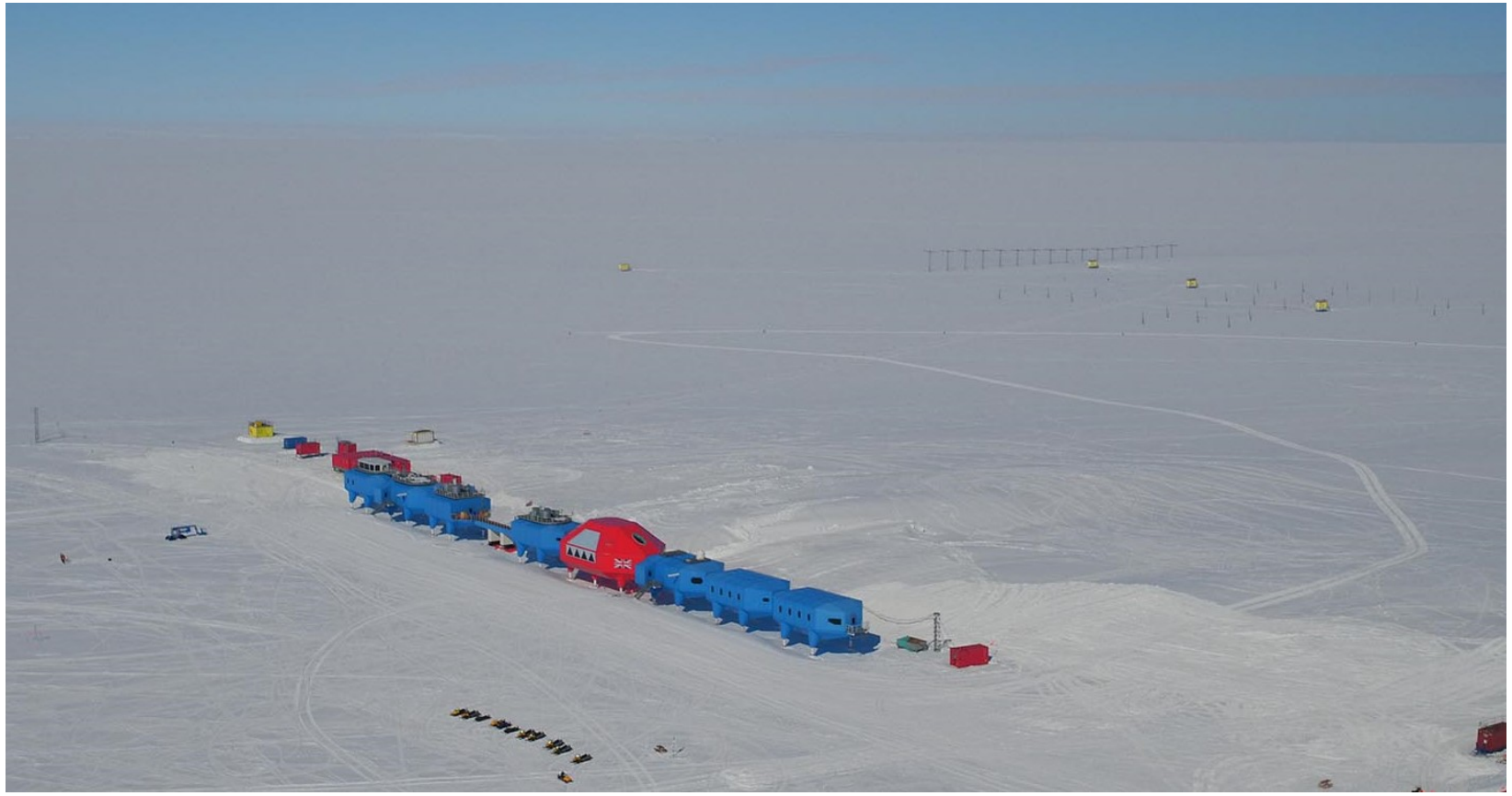
Halley VI: opened 2011, 15 people in winter, mainly atmospheric and space weather research.

Radio Frequency Instruments:

- **Very Low Frequency (Wideband, whistler detection, lightning location, subionospheric propagation experiments)**

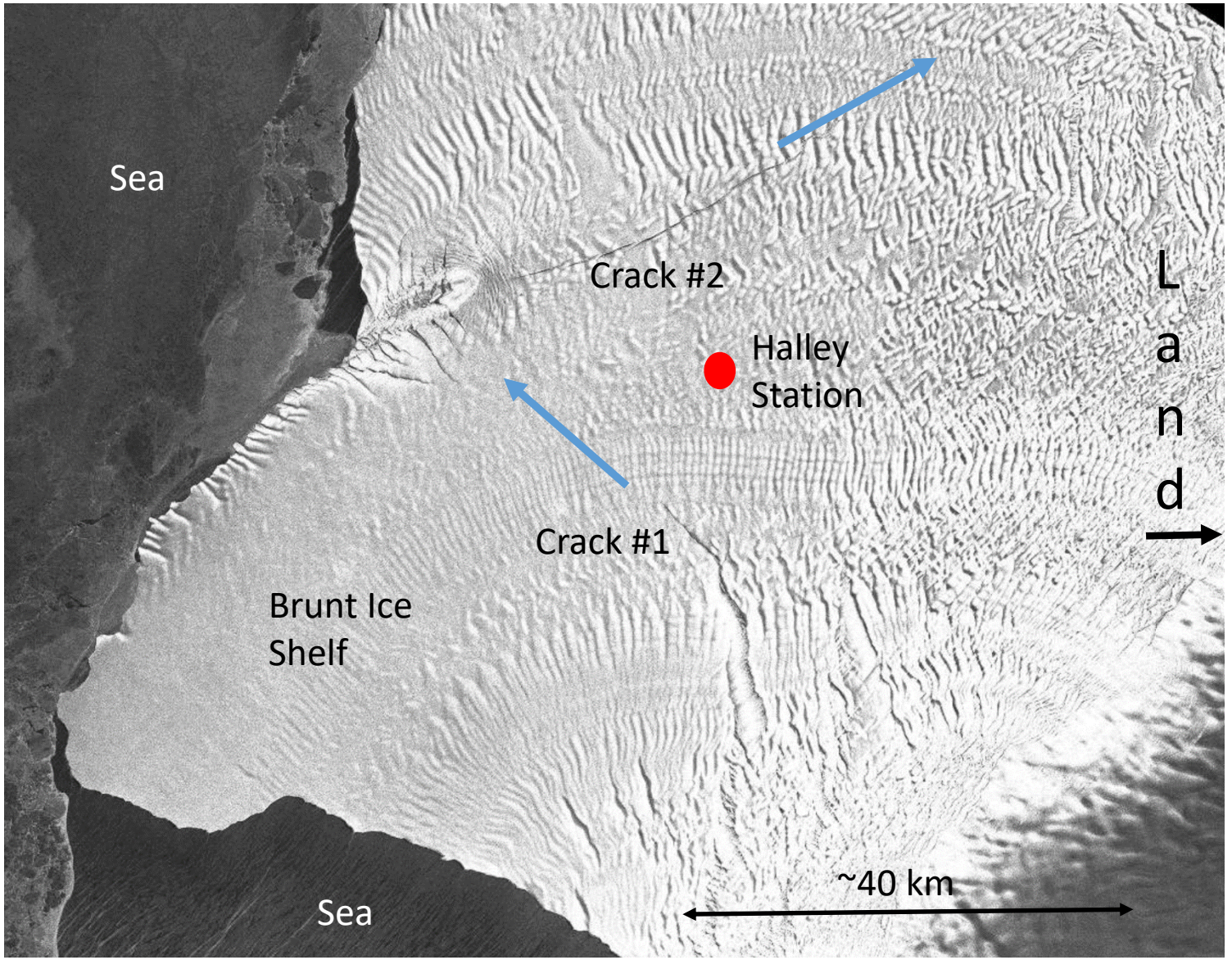
- **~2MHz Radar**
- **~10 MHz SuperDARN radar**

- **30 MHz Riometer**
- **Fluxgate Magnetometer**
- **Search Coil Magnetometer**



Brunt Ice Shelf (25 September 2017)

Our Antarctic Station Halley (75°S, 26°W) has experienced some recent difficulties with ongoing cracking of the ice-shelf upon which it is located.



Winter shutdown of Halley 6A

Currently the base is closed for the winter, and will open each summer.
However, our very low frequency radio-wave experiments continue to operate, running on solar and wind power, and we expect to increase the number of radio frequency instruments (like the riometer) that are powered this way in the coming summer seasons.

Radio frequency experiments at our other station on the Antarctic Peninsula, Rothera, are unaffected and continue to collect high quality data.

We will begin to thaw out the base in November, and re-commence scientific observations in Jan/Feb 2019.

Despite these issues, BAS is optimistic that they will have radio frequency instruments running at Halley in years to come, and we will be able to take a full and active role in RESOURCE.

GRAPE SIDE MEETING PARTICIPANTS

Name	Institution	Country
Giorgiana De Franceschi	INGV	Italy
Claudio Cesaroni	INGV	Italy
Lucilla Alfonsi	INGV	Italy
Emilia Correia	INPE/CRAAM	Brazil
Monia Negusini	IRA/INAF	Italy
Geonhwa Jee	KOPRI	Korea
Changsup Lee	KOPRI	Korea
Christoph Knofel	TU DRESDEN	Germany
Andreas Groh	TU DRESDEN	Germany
Christel Hansen	UNIV. PRETORIA	South Africa
Rongxing (Ron) Li	TONGJI UNIV.	China
Jayachandran P. Thayil	UNB	Canada
Andriy Zalizovski	INST. RADIO ASTRO.	Ukraine
Nicols Bergeot	ROB	Belgium
Adriana Maria Gulisano	IAA/DNA	Argentina
Takuji Nakamura	NIPR	Japan
Larry D. Hothem	USGS	USA
Markku Poutanen	FGI	Finland
Vladimir Papitashvili	NSF	USA
Jose Bageston	INPE	Brazil
Yasunobu Ogawa	NIPR	Japan
Jiachum An	WUHAN UNIV.	CHINA
Stefan Velev	BULG. ANTA. INST.	Bulgaria
Dragomir Mateev	BULG. ANTA. INST.	Bulgaria
Anoop Kumar Tiwari	NCAOR	India

DAVOS 2018

POLAR 2018