SCAR Sub-Group	**xxx**
SG / SC	PS / LS / GS / SC-HASS
Person Responsible:	xxx

XXXVII SCAR Delegates Meeting

India, September 2022

GRAPE (GNSS Research and Application for Polar Environment)

2020-22 Report

Summary *(no more than one page)*

GRAPE was born in 2012 and it is a **joint Physical Science and Geoscience group**. In the last two years the group efforts have been addressed to: **1)** organize an on-line workshop, 1-3 July 2020 (http://www.grape.scar.org/index.php/conferences/on-line-workshop) and one scientific session "GHJ: The polar environment and geospacer" in the frame of the URSI General Assembly and Scientific Symposium, (Rome, 28 August-4 September 2021), **2)** to coordinate polar (Arctic and Antarctic) experimental campaigns, **3)** to manage data, archive, and data base, **4)** to maintain the GRAPE web portal (www.GRAPE.scar.org). The group worked to enlarge the scientific and technological issues within Solar Terrestrial interactions and Space Weather, including the interaction between neutral and ionized atmosphere, mainly based on Radio Science. This action has been concluded and **a Proposal Planning Group named RESOURCE (Radio Sciences Research on AntarCtic AtmosphEre) has been re-submitted** on June 2 to PSG to be recommended for consideration by the Delegates**.**

The initial core membership includes 29 members from 18 Countries, representing the physical sciences and the geosciences. The proposed SRP, taking advantage of the experience of GRAPE, aims to gather the communities that investigate the polar atmosphere, with reference to Antarctica but with a bi-polar perspective, by means of radio probes into a common shared initiative. The scope is to improve the current understanding of the Antarctic atmosphere by sharing the expertise and the experience achieved by several scientific teams in the world, thus facilitating the advancement in the field and avoiding any duplication of activities already in action. Moving from the radio probing of the atmosphere, the proposed SRP aims to encompass the ICESTAR (past SCAR SRP) heritage to fill the current gap of SRPs dedicated to the study of the atmosphere, the upper atmosphere, and the solar-terrestrial relationship.

GRAPE is planned to be embedded in the PPG RESOURCE. In case the PPG in its current form will not be recommended for consideration by Delegates, GRAPE would continue its activity until the next SCAR OSC 2024.

The funds allocated to GRAPE in 2021-2022 were not spent due to the restrictions imposed by COVID 19 pandemic.
This report is submitted to both Physical Science and Geosciences Groups Officers.

Report Author(s)

(*Please indicate country too*)
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Summary of activities from 2020-22

(Please provide highlights of your group's progress since the last report to SCAR Delegates in 2020, covering major activities/achievements, upcoming activities and key challenges faced).

- Organization of the GRAPE online workshop, (http://www.grape.scar.org/index.php/conferences/on-line-workshop). The workshop has been taken place on 1-3 July 2020, 13:00-15:00 GMT each day, via Google Meet. The workshop registration was free of charge. The workshop received about 100 registrations. On the average about 70 colleagues from all over the world participated to the workshop along the three days, many of them had the possibility to interact actively by chat and by microphone. Several Early Career Researchers/Students followed the workshop as well. The full report on the workshop is available here http://www.grape.scar.org/index.php/resources.
- Publication of the white paper "Polar atmosphere and Geospace: Present knowledge, infrastructures and future research directions", September 2020, available here https://www.scar.org/scar-library/search/science-4/physical-sciences/grape-2/5539-grape-white-paper-2020/
- Organization of the scientific session "GHJ: The polar environment and geospacer" in the frame of the URSI General Assembly and Scientific Symposium, (Rome, 28 August-4 September 2021)
- Maintenance and updating of the GRAPE web.
- Coordination of international efforts for drafting the new PPG RESOURCE, last submission June 2, 2022.
- Coordination of activity for a review paper titled "Review of environmental monitoring by means of radio waves in the (Ant)Arctic: from atmosphere to geospacer" related to GRAPE/RESOURCE, submitted to Surveys in Geophysics in March 2022, and accepted in June 2022 for publication with minor revisions.
- Coordination for data management and archive from Arctic and Antarctic experimental infrastructures of GRAPE interest.
- Outreaches activities, carried out at national level

Summary Budget 2021 to 2024

	2021	2022	**2023**	**2024**
	Spent	Allocated	Request	Request
(US$)	--	5000 USD	1000 USD	4000 USD

Progress to date

(*Summarize your group's activities and plans in the tables below and, in each case, provide your sub-group name in the left-hand column to assist Science Group COs in compiling their reports*)

GRAPE does not have sub-group and the main outcomes are those listed above

Sub-group Outcomes Summary

Sub-group	Activity/Outcome/Benefit/Achievement
GRAPE	Workshop, sessions organization
GRAPE	Web portal maintenance
GRAPE	Coordination of data archive and management
GRAPE	Coordination of papers publications
GRAPE	Coordination of outreach activities

Sub-group Cash Flow

(Since previous report to Delegates in 2020)

Sub-group	Allocation	Amount spent		
		2020	2021	2022
GRAPE	5000	--	--	--

Future plans

Planned activities in 2022 to 2024

Sub-group	Planned activity
GRAPE	Scientific session organization "High Latitude Ionosphere" within the URSI GASS2023 (Sapporo, Japan 19-26 August 2023)
GRAPE	Organization of a scientific session "Polar effects on GNSS" within the Beacon Satellite Symposium (1-5 August 2022, Boston College, USA) https://www.bc.edu/content/bc-web/research/sites/institute-for-scientific-research/events-conferences/bss2022/SessionDescriptions.html
GRAPE	GRAPE web management and updating
GRAPE	Dissemination and outreach activities

Planned use of funds for 2022 to 2024

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2022	Review paper publication on Surveys in Geophysics	3000	Lucilla Alfonsi	Lucilla.alfonsi@ingv.it
2024	SCAR2024/support to ECRs and registration fees for session conveners from GRAPE	5000	Nicolas Bergeot	nicolas.bergeot@oma.be
2023	Web maintenance and updating	2000	Giorgiana De Franceschi	giorgiana.defranceschi@ingv.it
Total		**10000**		

Any additional detail on funds usage and desired results/outcomes

Percentage of the budget to be used for support of early-career researchers

2022: -

2023: 50%

2024: 50%

Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes

2022:-

2023:30%

2024: 30%

Membership

Leadership

Role	First Name	Last Name	Affiliation	Country	Primary Language	Email	Date Started
Chief Officer	Giorgiana	De Franceschi	INGV	Italy	Italian	giorgiana.defrancesc hi@ingv.it	2012
Deputy Chief Officer	Nicolas	Bergeot	ROB-OMA	Belgium	French	nicolas.bergeot@oma .be	2016

*(Please identify early-career researchers with * in first column)*

Other members

The full list of other members is available at www.grape.scar.org

First Name	Last Name	Affiliation	Country	Primary Language	Email

Additional information (optional)

(Please add any more detail here that you wish on your sub-group activities, papers published, etc.)

Notable Papers

(*Five to ten most notable papers – see the example below, which includes a brief statement (shaded) indicating the link to the group*)

- Alfonsi, Lucilla et al., Review of environmental monitoring by means of radio waves in the (Ant)Arctic: from atmosphere to geospace, submitted to Surveys in Geophysics March 2022, accepted for publication with minor revisions June 2022.

This review paper focuses on the observing capabilities and scientific knowledge gained in the last two decades by the international community that studies the atmosphere and the geospace using observations acquired at and over the polar regions by means of radio probing supported by auxiliary methods. The review on ionospheric weather describes some examples of what we learnt and suggests what we do not know yet. Moreover, the overview of long term investigations and space weather events testifies how, despite the remoteness and harsh conditions of the polar environment, the scientific community is improving significantly its capacity to monitor the atmosphere at high latitudes. A lot more should be done and specific actions are proposed. Finally, the survey points out the urgent need to reinforce the existing international coordination to overcome the current gaps in the observing systems, from ground-based and satellite equipment, and to stimulate and facilitate the adoption of a multidisciplinary approach as the preferred method to significantly advance the state of the art in the knowledge of global change and the geospace environment.

Direct support from outside organisations received for your activities

(*Numbered list with values indicated if direct cash support. Please restrict in-kind support to substantive in-kind support only*)

The activity is mainly supported by individual national programs, funding national projects.

Major collaborations your group has with other SCAR groups and with organisations/groups beyond SCAR

(*Numbered list of substantive collaborations*)

Within SCAR

1. Physical Science and Geoscience Groups

Outside SCAR

1. URSI COMMISSIONS G, H, J
2. COSPAR

Outreach, communication and capacity-building activities

(Brief highlights of any activities undertaken since the last report to SCAR Delegates in 2020).

Outreaches activities are carried out by national initiatives. Seminars, fairs, events are yearly supported by GRAPE community. Regularly GRAPE events are communicated to the SCAR board for spreading through suitable channels

Contributions to equality, diversity, and inclusion (EDI)

(Any specific actions the group has undertaken to advance EDI within the group and/or within SCAR)

SCAR fellowship reviewers

(As part of SCAR's Capacity Building efforts, such as the Fellowships and Visiting Scholar Awards, we are looking for people from all the SCAR groups to form a 'review panel' so if applications in your field are submitted we have people to contact to help assess relevant applications. Please list one or more people (name and email address) from your group who would be willing to serve as reviewers for the next few years, along with 1-3 keywords on their principal expertise.)

First Name	Last Name	Email	Principal Expertise
Nicolas	Bergeot	nicolas.bergeot@oma.be	Ionosphere, plasmashere, geodesy
Lucilla	Alfonsi	lucilla.alfonsi@ingv.it	Ionosphere, space weather
Monia	Negusini	negusini@ira.inaf.it	Neutral atmosphere, water vapor
Emilia	Correia	ecorreia@craam.mackenzie.br	Multi-instrument monitoring, space weather, VLF