



International
Science Council

SCAR Sub-Group

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SCAR Executive Committee Meeting 2019

Plovdiv, Bulgaria, 29-31 July 2019

GRAPE (GNSS Research and Application for Polar Environment) 2018-19 Report

Officers: Giorgia De Franceschi- INGV, Rome, Italy, Nicolas Bergeot, ROB, Belgium

GRAPE was born in 2012 and it is a joint Physical Science and Geoscience (expert) group. The group is working to enlarge the scientific and technological issues within Solar Terrestrial interactions and Space Weather mainly based on Radio Science. This action will be presented to the next SCAR2020 in order to discuss a possible new SRP (RESOURCE) or a new expert group embedding GRAPE that will finish its action in 2020.

Optional additional information

Outreach, communication and capacity-building activities

- Educational activity - International School of Space Science - TRAINING COURSE & TEAM BUILDING ACTIVITY "The Polar Upper Atmosphere: from science to operational issues", L'Aquila, Italy, 21-27 September 2018. <http://www.cifs-iss.org/pastcourses.asp>
- Communication activity-Luca Spogli "Space climate and space weather from the Arctic", lecture in the frame of the "Master in Sustainable Development, Geopolitics of Resources and Arctic Studies" September 2018, (SIOI -www.sioi.org/en). The objective of the Master was to develop skills and competences in the fields of green economy, energy geopolitics and resources with particular attention to eco-sustainability and responsible use of the territory. An in-depth focus was dedicated to the geo-strategic and economic importance of the Arctic regions, for which space weather related issues have a significant role.
- SANSA Space Science Open Day 2018 on 10 August 2018 - presentations and exhibits related to SANSA's Antarctic research programme (South Africa), including projects and activities related to GRAPE and DemoGRAPE (<https://www.sansa.org.za/event/space-agency-open-day/>)
- Symposium of the South African National Antarctic Programme (SANAP), Hermanus, 13-16 Aug 2018 - presentations were made among others about GRAPE related activities in Antarctica by SANSA researchers (<https://www.sanap.ac.za/event/5th-sanap-symposium-hermanus/>)
- Dissemination & Communication activity-Federica La Longa, Massimo Crescimbeni, Lucilla Alfonsi, Claudio Cesaroni & Vincenzo Romano

(2018). Expedition to the South Pole: experience of the laboratory game on polar sciences with primary schools,
<https://doi.org/10.3301/ROL.2018.25>

- Dissemination & Communication activity- Wrasse, C. M., Figueiredo, C. A. O. B., Takahashi, H. & Bageston, J.V. (2018). Stable Auroral Red (SAR) Arc Observed at King George Island in 2017. VarSITI Newsletter, 20, 3-4.
http://newserver.stil.bas.bg/varsiti/newsL/VarSITI_Newsletter_Vol20_high_reso_REV.pdf.
- Dissemination & Communication activity- Moffat-Griffin, T., Taylor, M., Nakamura, T., Murphy, D., Bageston, J. V. & Jee, G. (2019). Atmospheric gravity wave science in the Polar regions. EOS, 100, 1-5, Eos, 100, <https://doi.org/10.1029/2019EO120071>

Updates for your group's SCAR web page

GRAPE WEB pages www.grape.scar.org are continuously updated as well the SCAR web at <https://www.scar.org/science/grape/grape/>.

Notable Papers

1. De Franceschi, G., Spogli, L., Alfonsi, L., Romano, V., Cesaroni, C. Hunstad, I. (2019). The ionospheric irregularities climatology over Svalbard from solar cycle 23. Scientific Reports, Nature Publishing Group, in press, <https://doi.org/10.1038/s41598-019-44829-5>

This work provides an unprecedented description of the climatology of ionospheric irregularities over the Arctic derived from the longest GNSS data series ever collected for this specific aim. The results offer realistic features of the high latitude ionosphere that can substantially contribute to the necessary improvements of forecasting models, providing a broad spectrum of ionospheric reactions to different space weather conditions.

2. Prikryl, P., Nikitina, L., and Rusin, V. (2019), Rapid intensification of tropical cyclones in the context of the solar wind-magnetosphere-ionosphere-atmosphere coupling, Journal of Atmospheric and Solar-Terrestrial Physics, 183, 36-60.
<https://doi.org/10.1016/j.jastp.2018.12.009>

This work highlights the interaction between lower and upper atmosphere and the influence of the polar/high latitude on the tropical cyclones. Rapid intensification of tropical storms tends to follow arrivals of high-speed solar wind. Atmospheric gravity waves launched from high latitudes can reach tropical cyclones, can trigger moist instabilities leading to convective bursts, linked to rapid intensification of tropical cyclones.

Other information for publicity purposes

Please add here details of, or links to any other information we may use for publicity purposes, such as photos, infographics, quotes and layperson's summaries of your research.

- GRAPE is in contact with Alice Oates to which some photos and videos have been sent recently (March 2019).

Any other information or issues you would like to raise

Sessions planned for forthcoming events:

- THE POLAR ENVIRONMENT AND GEOSPACE, joint session between commissions G,H,J - URSI GASS2020 (www.ursi2020.org), 29 August-5 September 2020, Rome, Italy.
- REMOTE SENSING OF THE POLAR ATMOSPHERE, session submitted to SCAR2020 OSC (Hobart,Tasmania, 3-7 August 2020) within Harnessing emerging technologies for Antarctic Science
- SPACE WEATHER FROM ANTARCTICA: RECENT ADVANCEMENTS AND FUTURE CHALLENGES, session submitted to SCAR2020 OSC (Hobart,Tasmania, 3-7 August 2020) within Astronomy and Astrophysics in Antarctica