



The SCAR Expert Group GRAPE (GNSS Research and Application to Polar Environment) activities 2012-2023.

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The main threat to the reliable and safe operation of the Global Navigation Satellite System (GNSS) is the variable propagation conditions encountered by GNSS signals as they pass through the Earth's upper atmosphere, particularly at high and low latitudes and under perturbed conditions coming from the outer space. During severe external conditions or Space Weather events, the ionosphere exhibits irregularities in the electron density distribution that may be observed by specifically modified GNSS receivers able to monitor the Total Electron Content (TEC), i.e., the number of free electrons in a columnar cylinder of a unit area along which the signal travels between the satellite and the receiver. These irregularities can cause sudden, rapid, and irregular fluctuations of the amplitude and phase of the GNSS received signals, termed “ionospheric scintillation”. Scintillation can cause degradation on GNSS measurements and, in the worst case, can lead to the loss of lock with the satellite, affecting the availability of the GNSS based services.

With the aim of tackling the polar atmosphere and its effects on GNSS-based systems, GRAPE (GNSS Research and Application for Polar Environment) was established as an Expert Group of SCAR (Scientific Committee on Antarctic Research) during the Delegates Meeting of the XXXII SCAR OSC (Portland, USA, 2012). GRAPE (www.grape.scar.org), built on the former SCAR Action Group GWSWF (GPS for Weather and Space Weather Forecasting), dealt with the multi-instrument monitoring and investigation of the bi-polar neutral and ionized atmosphere, by encouraging the establishment of a permanent network of GNSS receivers for multi-purposes investigations over the Arctic and Antarctica and by involving international efforts within the topic of solar terrestrial interactions and Space Weather.

In 2023 GRAPE is going to conclude its main tasks, i.e., the networking of the scientific community dealing with the polar environment, and the involvement of students and early career scientists on the related topics.

An overview on SCAR together to main activities carried out by GRAPE to which greatly contributed “Antarctic women”, are presented to stimulate discussions and to encourage scientists and research groups to participate in the future actions within the Program Planning Group AGATA (Antarctic Geospace and ATmosphere research), recently approved by SCAR aiming to propose a new Scientific Research Programme (SRP).