

Abstract for Beacon Satellite Symposium 2019, Poland for the session on “Polar (high-latitude) Effects on GNSS”

Title: Multi-constellation GNSS observation of ionospheric scintillation at SANAE-IV in Antarctica

Authors: Pierre Cilliers¹, Lucilla Alfonsi², Emilia Correia³, Nicolas Bergeot⁴, Fabio Dovis⁵, Nicola Linty⁵, Jonathan Ward¹

Affiliations:

¹South African National Space Agency (SANSA), Space Science Directorate, Hermanus, South Africa, ²Istituto Nazionale di Geofisica e Vulcanologia (INGV), Upper Atmosphere Physics, Rome, Italy, ³Divisão de Astrofísica/CEA/INPE, ⁴Royal Observatory of Belgium, Planetology and Reference Systems, Brussels, Belgium, ⁵Politecnico di Torino, Italy

Abstract: SANSA (South Africa) and INPE (Brazil) are key collaborators on the international DemoGRAPE project initiated by INGV (Italy) which is designed to improve satellite navigation in Antarctica. DemoGRAPE is a demonstrator using cutting edge technology for the empirical assessment of the ionospheric delay and ionospheric scintillations at GNSS frequencies in the polar regions. Observations are provided by multi-constellation receivers located at Concordia (75.10°S, 123.35°E), Mario Zucchelli (74.41°S, 164.10°E) and SANAE (71.68°S, 2.83°E) stations. The Brazilian node of DemoGRAPE which was originally installed at King George Island, South Shetland Islands was relocated to São Paulo (Mackenzie University, 23.54°S, 46.65°W), which is located inside the South American Magnetic Anomaly (SAMA). Our study includes scintillations derived from GPS, GLONASS and Galileo data, captured by means of commercial and software-defined GNSS receivers. The objective of the project is to assess the corruption induced by ionospheric irregularities on the propagation of GNSS signals and to share data and results by means of a federated cloud infrastructure. The system has been collecting data for 4 years without any interruption. The observations of ionospheric scintillation are complemented by co-located instruments for geomagnetic and ionospheric observations, which facilitate the investigation of physical mechanisms triggering the observed scintillations. The paper presents an overview of the systems used for the collection and dissemination of the scintillation data, and some interesting events recorded with this network of receivers since its installation in 2015 including a comparison of the effects on GNSS simultaneously observed at the Antarctic region and in the South American Magnetic Anomaly.