Radio wave scintillation due to the presence of ionospheric irregularities can cause fading and phase variation of L-band navigation signals such as those used by Global Navigation Satellite System (GNSS). The high-latitude regions experience increased scintillation events under geomagnetically disturbed conditions.

High precision navigation applications such as crevasse avoidance during overland travel, aircraft landing, and geological surveys in Antarctica, are affected by the corruption of GNSS signals resulting from ionospheric scintillation. During the International Polar Year 2007-2009, a high sampling rate (50 Hz) ionospheric scintillation monitor (Novatel GSV4004B) was deployed at the South African Antarctic Research Station SANAE IV (GEO 71.73°S, 2.5°W, and MLAT 66°S). From time to time during solar events, the auroral oval expands as far north as SANAE-IV. During such events perturbations of the ionosphere often results in increases in the electron density and concomitant TEC (Total Electron Content) gradients, which in turn causes ionospheric scintillations along the ray paths of GNSS signals (Ngwira C. M., McKinnell L. A., Cilliers P. J., GPS phase scintillation observed over a high-latitude Antarctic station during solar minimum. doi:10.1016/j.jastp.2010.03.014.). This paper presents climatology of the occurrence of ionospheric scintillations over Queen Maud Land in Antarctica over the period 2006 to 2014, as observed by means of the ionospheric scintillation monitor and co-located GNSS dual frequency monitors at SANAE as analysed by means of the GBSC software (Spogli, L., et al. Climatology of GPS ionospheric scintillations over high and mid-latitude European regions, Ann. Geoph. 27(9), 2009.). The occurrence of ionospheric scintillations is correlated with geomagnetic disturbances as recorded by means of the FGE magnetometer at SANAE-IV, which was deployed in 2007.

This study will address the objectives of the GRAPE (GNSS Research and Application for Polar Environment) SCAR Expert Group (http://www.grape.scar.org/) and provide important parameters regarding the frequency of occurrence and duration of ionospheric scintillation events at SANAE for the DemoGRAPE project (www.demogrape.net). DemoGRAPE will deploy a prototype of new demonstration technology for ionospheric scintillation at SANAE-IV during the Austral Summer of 2015/2016.