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SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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Author: Mr. Tiago Marques
University of Coimbra, Portugal, tiagomomarques@msn.com

SWAIR - SPACE WEATHER IMPACT ON GNSS SERVICE FOR AIR NAVIGATION

Abstract

Space Weather impact on GNSS service for Air Navigation (SWAIR) project aims at using available technologies to provide Space Weather (SW) early warning and forecast services for air navigation. Space Weather is a term which describes variations in the Sun activity, solar wind, magnetosphere, ionosphere, and thermosphere, which can weaken the performance and reliability of technological systems therefore also endanger human health and safety. Sun activity has different temporal cycles where the most known is the 11-years one for the sunspots. The most severe events usually take place at those maximums and in about four to five years a continuous increase of solar activity is expected. During the Solar Minimum, Earth is more exposed to flows of matter and energy from the Sun poles and from outside the Solar System. Severe space weather conditions resulting from the variation of solar and geomagnetic activities can perturb the ionosphere plasma. Ionosphere plasma irregularities are known as ionosphere scintillation and affects GNSS signals. The aviation sector has been one of the main drivers for the development of SW early warning and forecast services, not only due to the adoption of SBAS-based landing procedures but also derived from radio frequency blackouts during the air flights. The objective is to correlate GNSS discontinuities with SW events and raise awareness on the occurrence of solar events. To detect GNSS perturbations, the system use real time positioning and ionosphere information acquired by GNSS receivers installed at the airports. These perturbations will be correlated with the sun event detection observed by space science, and geomagnetic data. Data analysis and correlation: 1. Solar Observations: Flares and CMEs detection to forecast Solar Energetic Particle events. 2. Geomagnetic Data: We have evidences that solar activity influences the terrestrial magnetic field. A Geomagnetic storm can cause the complete interruption of the satellite-based services. The data collection requires continuous acquisition of magnetic data using local magnetometers to correlate with other sources of information. 3. Ionosphere Monitoring: Doing remote sensing of the Ionosphere provides data to assess the signal losses due to Sun-Earth interactions. The equipment allows the analysis of Scintillation Intensity and Total Electron Content. With this project aviation sector can benefit because air navigation and airports are dissatisfied with GNSS perturbations and scintillation on navigation aids for landing, namely using LPV approach procedures. For airlines, it can help on the optimization of airliners planning routes from safety perspective.