



Data Assimilation Techniques for Ionospheric Reference Scenarios – project overview and first results

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The European Geostationary Navigation Overlay Service (EGNOS) is the European Satellite Based Augmentation Service (SBAS) that provides value added services, in particular to Safety of Live (SoL) users of the Global Navigation Satellite Systems (GNSS). In the frame of the European GNSS Evolution Programme (EGEP), ESA has launched several activities, which are aiming to support the design, development and qualification of the future operational EGNOS infrastructure and associated services.

The ionosphere is the part of the upper Earth's atmosphere between about 50 km and 1000 km above the Earth's surface, which contains sufficient free electrons to cause strong impact on radio signal propagation. Therefore, treatment of the ionosphere is a critical issue to guarantee the EGNOS system performance. In order to conduct the EGNOS end-to-end performance simulations and to assure the capability for maintaining integrity of the EGNOS system especially during ionospheric storm conditions, Ionospheric Reference Scenarios (IRSs) are introduced by ESA.

The project Data Assimilation Techniques for Ionospheric Reference Scenarios (DAIS) – aims to generate improved EGNOS IRSs by combining space borne and ground based GNSS observations. The main focus of this project is to demonstrate that ionospheric radio occultation (IRO) measurements can significantly contribute to fill data gaps in GNSS ground networks (particularly in Africa and over the oceans) when generating the IRSs. The primary tasks are the calculation and validation of time series of IRSs (i.e. TEC maps) by a 3D assimilation approach that combines IRO and ground based GNSS measurements with an ionospheric background model in an optimal way.

In the first phase of the project we selected appropriate test periods, one presenting perturbed and the other one – nominal ionospheric conditions, collected and filtered the corresponding data. We defined and developed an applicable technique for the 3D assimilation and applied this technique for the generation of IRSs covering the EGNOS V3 service area. This presentation gives an overview about the DAIS project and the first results. We outline the assimilation approach, show test run results and finally address and discuss open questions.