

- **Iono-tropospheric disturbances mitigation system for SSA purposes**

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Abstract

Space Situation Awareness Concept in the layer related to *space environment* is based on monitoring and characterizing of environmental conditions relevant to space system and mission effects. SSA to be efficient needs access to actual and forecast terrestrial, near-space and space environmental information to predict, respond to and exploit environmental effects to operational activity in space.

Ground-based space systems like surveillance tracking radars for space control can be affected by the environment. Satellite system communication links and the satellite's respective ground sites can be affected by the environmental conditions in which they operate as well. Thus, the tools to implement the environmental information to improve performance or protect the systems is needed for effective SSA.

One of the most important environmental components which set up the space weather element influenced on efficiency of communication channels and surveillance tracking radars is **the ionosphere**, exactly its density gradients and small-scale irregular structure. The resulting properties like **ionospheric refraction and signal scintillation** cause the spectrum of effects.

Generally, the quality of signal propagating through the atmosphere and ionosphere in different parts of spectrum, depends, from one side, on the atmospheric ingredients like dry air, water vapor, hydrometeors, and other particulates (sand, dust, aerosols, and volcanic ash) , on the other side on ionospheric plasma structures introduce microwave propagation delays. These delay, must be properly characterized to achieve the highest accuracy in space related applications.

Thus, it is clear that the knowledge of large scale and small scale distribution of electron density in the ionosphere is one of the important task for operational SSA. The method of solution generally has to model an anisotropic thermosphere using a mapping function and consider horizontal plasma gradients. More complex models would require a more sophisticated approach to resolve additional irregular ionospheric parameters. Special cases have to deal with complex modeling assimilated by independent measurement of thermosphere anisotropies.

For these purposes the following tasks have been elaborated:

- Elaboration for some existing dual ionospheric model of electron density (like NeQuick , PLES) tools for regional assimilation of their profiles.
- Determination the model of small scale structures “on the profile” with appropriate dielectric tensor for different type of plasma and ingredients.
- Integrate the small scale and large scale ionospheric profile of ionospheric density
- Incorporate the “ray-tracing” tool into **SSA propagation package**
- Formulate the Service suitable for SWENT structure

We present here the modeling of environmental conditions for SSA purpose including Space Weather elements that are integrated into two other layers as well as located in the European architecture of SSA Structure.