Use of Radio Occultation Data in Ionospheric Assimilation Algorithms

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Specification of the ionospheric electron density distribution is important to various components of the Radio Occultation (RO) community because the ionosphere can introduce biases into the lower atmospheric retrieval products that are routinely assimilated by meteorological models. The lack of ionospheric RO data is becoming a limiting factor in the inversion of RO data from the lower atmosphere for operational purposes.

Ionospheric specification is also an important goal for the space weather community, because of its operational usefulness for communications, navigation, and surveillance, and various aspects of Space Situational Awareness.

The launch of the COSMIC constellation promises to provide large amounts of ionospheric measurements that can be used by the space weather community for operational and research purposes. This will only be realized if the focus on terrestrial retrievals does not result in unnecessary exclusion or reduction of ionospheric capability. The COSMIC sensors should incorporate a complete set of ionospheric measurements including both ionospheric total electron content and scintillation (high rate data scintillation measurements on all available line of sight TEC measurements, not only at the tangent point). Potentially, the resulting ionospheric specification will then be more accurate, and could also be made available to the general RO community to help improve lower atmosphere retrievals.

Ionospheric data assimilation is well developed, and various tools are already available for ingestion of COSMIC data, and which could be used routinely for specification of the global ionospheric electron density distribution. The output from these tools could also be integrated into the research and operations communities that assimilate RO data for lower atmosphere purposes. In this presentation, we discuss some of the available tools, with examples of their use, and discussion of their capabilities.