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IRI-based Real Time Assimilative Model (IRTAM): The Way Forward

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The International Reference Ionosphere (IRI) [1] serves as a background climatology model for a suite of *Assimilative IRI* techniques [2] that modify the background climate specification into a better match with available measurements, thus obtaining an ionospheric *weather* nowcast. When the required measurements are available with a low latency from their acquisition by a sensor, such subclass of the Assimilative IRI solutions becomes realistic for the operational implementations in order to serve those fielded radio systems that rely on the knowledge of the ionospheric conditions. The paper discusses current state and the way forward of the IRI-based Real-Time Ionosphere Model (IRTAM) [3] that uses low-latency inputs from the Global Ionosphere Radio Observatory (GIRO) [4] to periodically compute and release updated coefficients of the diurnal 2D maps of the four major ionospheric properties: peak density NmF2 and height hmF2, and two IRI profile shape parameters for the bottomside, B0 and B1. In combination, these maps provide a prompt 3D weather nowcast of the bottomside ionosphere at a 15-minute cadence with a 7-minute latency from the start times of the ionograms. Going forward, the IRTAM team looks for new data sources of ionosphere sensing data that can be assimilated to improve spatial resolution and content of the nowcast. For this objective, two collaborative projects are actively pursued:

(1) Combination of the GIRO's global NmF2 with the multi-site GNSS vertical total electron content (VTEC) measurements available at the IGS Ionosphere Combination and Validation Center (ICVC) at University of Warmia and Mazury [5]. This coordination will enable assimilative modeling of the slab thickness τ = NmF2/VTEC and the topside slab thickness $\nu = \tau - \beta$, where β is the bottomside slab thickness computed from the IRTAM vertical profile; and

(2) Combination of the COSMIC-derived radio occultation profiles with the IRTAM bottomside specification for improved peak height hmF2 representation and extended IRTAM coverage to the topside ionosphere to then reliably distinguish the ionosphere vs plasmasphere contributions to the space weather dynamics.

The paper will discuss current state and prospects of the collaboration projects going forward.

References

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