

## **New IGS Ionospheric Analysis Centers (NRCAN, CAS- IGG, WHU and DGFI-TUM)**

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## ABSTRACT

In this presentation the independent techniques to assess global Vertical Total Electron Content (VTEC) ionospheric models computed from GNSS data (GIMs) are applied in the context of the International GNSS Service (IGS): to the GIMs of CODE, ESA, JPL and UPC (analysis centers contributing since 1998.5), NRCAN (resuming its contribution), and Chinese Academy of Sciences (CAS), Wuhan University (WHU) and Technische Universität München, Deutsches Geodätisches Forschungsinstitut (DGFI-TUM) as new contributors.

Two important and complementing aspects of the ionospheric models are assessed: On one hand the VTEC accuracy, by comparing with direct measurements of VTEC up to the orbital height of dual-frequency altimeters (around 1200-1300 km, containing the most part of electro content affecting GNSS signals), providing them over the seas (i.e. typically far from existing receivers, assessing mostly interpolation), and with almost no interruption since the beginning of the IGS ionospheric service (missions TOPEX, JASON-1 and JASON-2). And, on the other hand, the Slant Total Electron Content (STEC) provided by the GIMs, typically not far from the receivers used in their computation, is assessed versus very precise direct STEC observations taken by GNSS receivers in different regions of the world, not used in the GIMs computation.

The first VTEC assessment results obtained during the recent periods show a very good behavior of the new GIMs (EMR, CAS, WHU & DGFI-TUM) in terms of VTEC bias regarding to JASON2 direct measurements, compared with the existing GIMs, contributing since 1998.5 (CODE, ESA, JPL & UPC). From the point of view of the corresponding Standard Deviations, the new GIMs present, in general, similar, or either better precision than the existing IGS GIMs and their combinations. The extended VTEC assessment will be completed with the STEC one.

Finally the convenience of maintaining the good practice of a right assessment of ionospheric models, by using external measurements, absolutely independent from any of the compared models, will be emphasized.

It is remarkable as well the general agreement of the bias, at 1 to few TECUs level, regarding the altimeter VTEC for the most part of analysis centers. This happens among different mapping functions used (related with the general leveling) and the topside electron content climatology between the altimeter and GPS orbit (seen as variations interpreted as “inverse climatology”,  $\langle \text{VTEC}_{\text{alt}} - \text{VTEC}_{\text{GPS}} \rangle$ , in the time series, appearing clearly the Solar Cycle and seasonal cycles, among others