

Comment on essd-2021-136

Anonymous Referee #2

Referee comment on "The cooperative IGS RT-GIMs: a reliable estimation of the global ionospheric electron content distribution in real time" by Qi Liu et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-136-RC2>, 2021

The authors address in their study the generation of a specific real-time data product of IGS. This is the IGS combined Real-Time Global Ionosphere Map (RT-GIM) generated by real-time weighting of RT-GIMs computed simultaneously at four IGS real-time ionosphere centers. Because different centers use different approaches to estimate global TEC the combination of different approaches is not trivial. Consequently, the authors discuss this topic in detail. Validation of the performance of contributing ionosphere center related TEC estimates and the combined products is carried out by using independent altimeter data (1 month) from Jason-3 satellite over oceans and the dSTEC technique over continents (2 days). Comparison is also made with better conditioned post-processed GIMs. The authors finally conclude that the IGS RT-GIMs are a reliable source of real-time global VTEC information having a great potential for real-time GNSS applications.

The results should principally be of interest for readers of ESSD.

The manuscript is well organized. Nevertheless, there are a few points which need improvement/clarification in a revised version as indicated in the subsequent comments:

Science

Considering the Jason3-VTEC assessment the constant bias estimate includes practically the plasmaspheric electron content above 1300 km height which definitely is not constant on global scale. This is clearly a weak point in the subsequent weighting practice which is based on the RMS error between VTEC (Jason) and the GIMs. This critical point concerns also the dSTEC technique if arc lengths between measurement and reference point are large, i.e. if the ray path geometry changes significantly. Additionally, mapping function errors are also included in the RMS error that is used as weighting criterium for different

centers. Here arises also the question whether the different centers use exactly the same data base for the construction of their GIMs. If not, there is another source of uncertainty for estimating the weighting of different centers.

I think the authors should discuss these problems in their manuscript adequately.

Data set

The data set includes 1 month of Jason 3 vertical TEC data over oceans and 2 days of ground based GNSS data over land. Thus, the data base is very limited to derive general conclusions on physical relationships concerning the physics of the ionosphere. However, the authors use the data set to demonstrate the estimation of VTEC at 4 data different data centers and the procedure of combining their VTEC estimates in near real time. Thus, the data set is appropriate and of high quality. The question is, whether all centers use the same data set to ensure a fair comparison.

Wording

Headline: The authors should avoid the term “accurate” in the headline because this requires a clear definition what accuracy means. The authors themselves conclude later in line 311 that the accuracy should be increased.

Abstract: The abstract should have clear and compact statements concerning the results of the paper. Thus, for instance, there is a very long sentence covering lines 15- 19 that contains several illustrations in brackets which should be avoided in the abstract.

Line 8: the real-time weighting **technique** is sensitive to the accuracy of RT-GIMs

As I understand the weighting is dependent from the accuracy, not the technique

Line 203: correct "... **IGS**-SSR is compatible with RTCM-SSR contents, while **IGS**-SSR..."

Equations

(6): Please check the correctness, eq. is not understandable

Figures

Fig 5: needs precise description, the zoom refers