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Use of GIMs in high and midlatitudes

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The technology of global ionospheric maps (GIMs) is one of most prevailing methods of ionospheric studies, which allows to estimate vertical total electron content (VTEC) almost all over the Earth with the resolution of 5° of longitude and 2.5° of latitude and temporal step of 2 h. The methods applied in the GIM construction at several data processing centers are different although all based on the common idea of finding the appropriate model parameters to fit the selected model of the vertical distribution of electron density to the observed GPS data. To understand if GIMs may be similarly used in any conditions we compared this method with the results of low-orbital radio tomography (LORT) reconstructions along RT systems in Russia and Alaska during 2003-2007 years.

To find out more information about ionosphere we examined the results of UV-spectrometry as a principally different method of VTEC's estimation as far as night emissions of O^+ ions, generated by its reaction of radiative recombination with electrons, in first approximation, are proportional to the integral of squared electron density. We studied the data of Global Ultraviolet Imager (GUVI), which is one of four instruments constituting the TIMED (Thermosphere Ionosphere Mesosphere Energetics and Dynamics) spacecraft. It is a far-ultraviolet (115 to 180 nm), scanning imaging spectrograph that provides horizon-to-horizon images in five selectable wavelength intervals, or "colors". These colors (HI 121.6 nm, OI 130.4 nm, OI 135.6 nm, and N2 Lyman-Birge-Hopfield bands 140 to 150 nm and 165 to 180 nm) are chosen in order to produce the GUVI key parameters.

The analysis shows that the resolution of GIMs, is not, at fact, as good as declared. Large structures reaching the size of about 10° distinctly reconstructed by LORT and well seen in GUVI data are often not observed in GIMs or have larger scales, especially during the periods of strong geomagnetic activity. GIM vertical TEC is often much more smoothed, compared to LORT data, and can't represent all fast processes taking place in the ionosphere. The reconstructions for quiet periods are basically similar, although higher GIM vertical TEC values compared to LORT vertical TEC, which might be due to the plasmaspheric contribution, are still noteworthy.

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