## SPHERICAL HARMONICS AND CHAPMAN PROFILE APPROACH FOR MODELING THE ELECTRON DENSITY

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**Summary:** This study investigates development of multi-dimensional model of electron density by applying spherical harmonics and Chapman profile on the combined measurements of different space geodetic techniques.

**Abstract:** In our recent investigations at the Institute of Geodesy and Geophysics (IGG), we developed Global Ionosphere Maps (GIM) of Vertical Total Electron Content (VTEC) from combination of GNSS observations, satellite altimetry, and Formosat-3/COSMIC (F-3/C) data. Comparing the developed models to the models derived from each individual technique, verifies the better accuracy and higher reliability of the combined solution.

This study aims at developing a global multi-dimensional model of electron density, by combining measurements from the same space geodetic techniques. This multi-dimensional model represents the height-dependency of the electron density within the ionosphere by a Chapman profile. The parameters of the Chapman profile, namely the layer of maximum electron density acts as a scaling factor and its height as a profile parameter. These two parameters are modeled by spherical harmonic expansions in longitude and latitude. The unknowns of this three-dimensional representation are estimated by least-squares adjustment of the combination of measurements. In addition the temporal variations of the spherical harmonic coefficients can be modeled by one-dimensional series expansions, e.g. Fourier series or spline expansions.