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Comparison of ionospheric peak parameters derived from different modeling approaches

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Due to the fact that Ionosphere is a dispersive medium, microwave signals travelling through this medium are affected proportional to their frequencies. This effect allows gaining information about the parameters of the ionosphere in terms of Total Electron Content (TEC) or the electron density. There are different approaches for modeling these parameters. Some models are based on physical properties such as the Global Assimilative Ionospheric Model (GAIM). Some are empirical models, e.g. the International Reference Ionosphere (IRI), the NeQuick model, or the Neustrelitz TEC Model (NTCM). Finally some models are based on purely mathematical/statistical approaches. In the mathematical models, the corresponding model parameters are calculated using measurements from different space geodetic techniques or the ionosonde data. This study investigates different approaches for computing the electron density along the ray path. First the mathematical approach developed at Technical University of Berlin (TUB) for global 3D reconstruction of the ionospheric F2-peak parameters is presented. In this approach, the F2-peak parameters, i.e. the maximum electron density and its corresponding height are represented as a function of geographic or geomagnetic longitude, latitude, and height with two sets of spherical harmonic expansions of degree and order 15, which correspond to a spatial resolution of 5° in longitude and 2.5° in latitude. To assess this modeling approach, the estimated F2-peak parameters are compared with the peak parameters derived from several other modeling approaches.