NEW MAPS FOR THE PEAK OF THE F2 LAYER ON THE BASIS OF AN IMPROVED DATA COLLECTION

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Abstract:

Modern applications of radio wave propagation in and through the ionosphere have a very large range of applications, from the classical terrestrial HF propagation to space based telecommunication, from the observation of planetary radio signals to satellite based navigation and positioning. System planning, assessment studies, propagation error determination and correction need data driven electron density models and maps of ionospheric properties. The basis of the so-called “profiler” type models are maps for the properties of their anchor points, the most important being the peak of the F2 layer. The classical “CCIR maps” have been constructed with monthly and hourly medians of critical frequencies foE, foF1, foF2 and of the F layer transfer parameter M(3000)F2. The data have been derived by “ionogram scaling” using observations by the global network of ionosondes. Originally the “CCIR maps” (data files and retrieval/reconstruction algorithms) have been published by the Comité Consultatif des Radiocommunications (CCIR) of the International Telecommunication Union (ITU) in 1962 and 1965.In the meantime we have not only gained substantially more data from ground ionosondes but especially for foF2 we also have data from topside-sounders which can help to close the large gaps of the ground ionosondes network. We also have electron content observations which can be used to bridge over data gaps by means of suitable interpolation methods and we have novel data sources provided by modern inversion methods, tomographic reconstruction and ionosphere imaging by means of satellite to satellite and satellite to ground electron content data.We have successfully developed a new map algorithm which is especially well suited for use in three dimensional and time dependent electron density models. Instead of maps for foF2 and M(3000)F2 we directly produce maps for the F2 peak properties, peak height and peak electron density. The maps are formulated for two levels of solar activity on a month to month basis. The internal map coordinates are modified dip latitude (MOPIP) and local time, the mapping procedure is the spherical harmonics analysis. Fourier interpolation ensures continuity of the maps in (local or universal) time.We have started with improving the data base by collecting foF2 data from various sources and we have developed suitable interpolation and nowcasting methods to produce F2 peak data from novel data sources.We will present map examples and examples for the retrieval of F2 peak density data from non ionosonde sources.