



## **Regional And Seasonal Aspects Of Within-The-Hour Tec Statistics**

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Ionosphere is one of the atmosphere layers which has a plasma structure. Several mechanisms originating from both space and earth itself governs this plasma layer such as solar radiation and geomagnetic effects. Ionosphere plays important role for HF and satellite communication, and space based positioning systems. Therefore, the determination of statistical behavior of ionosphere has utmost importance. The variability of the ionosphere has complex spatio-temporal characteristics, which depends on solar, geomagnetic, gravitational and seismic activities. Total Electron Content (TEC) is one of the major observables for investigating and determining this variability. In this study, spatio-temporal within-the-hour statistical behavior of TEC is determined for Turkey, which is located in mid-latitude, using the TEC estimates from Turkish National Permanent GPS Network (TNPNGN)-Active between the years 2009 and 2012. TEC estimates are obtained as IONOLAB-TEC which is developed by IONOLAB group ([www.ionolab.org](http://www.ionolab.org)) from Hacettepe University. IONOLAB-TEC for each station in TNPNGN-Active is organized in a database and grouped with respect to years, ionospheric seasons, hours and regions 2 degree by 3 degree, in latitude and longitude, respectively. The data sets are used to calculate within-the-hour parametric Probability Density Functions (PDF). For every year, every region and every hour, a representative PDF is determined. It is observed that TEC values have a strong hourly, seasonal and positional dependence on east-west direction, and the growing trend shifts according to sunrise and sunset times. It is observed that the data are distributed predominantly as Lognormal and Weibull. The averages and standard deviations of the chosen distributions follow the trends in 24 hour diurnal and 11 year solar cycle periods. The regional and seasonal behavior of PDFs are investigated using a representative GPS station within each region. Within-the-hour PDF estimates are grouped into ionospheric seasons as Winter, Summer, March equinox and September equinox. In winter and summer seasons, Lognormal distribution is observed. During equinox seasons, Weibull distribution is observed more frequently. Furthermore, all hourly TEC values in same region are combined in order to improve the reliability and accuracy of the probability density function estimates. It is observed that as being in mid-latitude region, the ionosphere over Turkey has robust characteristics that are distributed as Lognormal and Weibull. Statistical observations on PDF estimates of TEC of the ionosphere over Turkey will contribute to developing a regional and seasonal random field model, which will further contribute to HF channel characterization. This study is supported by a joint grant of TUBITAK 112E568 and RFBR 13-02-91370-CT\_a.