Comparison of FORMOSAT-3/COSMIC data with ionosonde for three Brazilian stations

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The Digital Portable Sounder (DPS) probes the ionosphere and makes real-time analysis of the data, by means of radio-wave transmission and reception. Furthermore, there are numerous satellites in orbit around the Earth carrying out measurements of the ionospheric parameters. One of the most modern techniques for obtaining this data is the GPS Radio Occultation (RO). Using the above techniques it is possible to obtain the electron density profiles of the ionosphere. However, Digisonde is only sensitive to the part of the ionosphere located below the maximum density peak; the upper ionosphere, located above the peak, is represented by a model. On the RO technique, using the FORMOSAT-3/COSMIC satellites, the profiles are inferred indirectly by the behavior of the radio signal crossing the Earth’s atmosphere and undergoing refraction. This signal is transmitted by one of the 32 GNSS satellites (which orbit the Earth at ~ 20200 km) and received by one of the 6 COSMIC satellites (at an orbit of ~ 800 km). Data provided from satellites are advantageous because they can cover almost all globe while the DPS’s give only local information. In this work, data from F3/C satellites and Digisondes will be used to conduct a comparative study between the values of the electron density peak (NmF2) and its height (hmF2) obtained by the two techniques. Data for some periods of 2006 and 2007 (low solar activity – LSA) will be selected and analyzed for the Brazilian stations: São Luís (Geog.: 2.6º S, 44.6º W; Mag.: I = -4.1°, D = -19.35°), Cachoeira Paulista (Geog.: 22.6º S, 45º W; Mag.: I = -34.15°, D = -19.32°) and Fortaleza (Geog.: 3.76º S, 38.51º W; Mag.: I = -12.85°, D = -19.88°). Scatter plots for NmF2 and hmF2, with standard deviation, will be constructed for the ionosonde versus Radio Occultation data. The objective is to compare the data already available for Digisondes with data from satellites, in a quiet period, and examine the compatibility between them. This validation is important for future studies of the dynamics of the ionosphere over the entire Brazilian region using COSMIC measurements.