Use of Total Electron Content data to analyze ionosphere electron density gradients

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In presence of electron density gradients the thin shell approximation for the ionosphere, used together with a simple mapping function to convert slant Total Electron Content (TEC) to vertical TEC, could lead to TEC conversion errors. Therefore these "mapping function errors" can be used to identify the effects of the electron density gradients in the ionosphere. In the present work high precision GPS derived slant TEC data have been used to investigate the effects of the electron density gradients in the middle and low latitude ionosphere under geomagnetic quiet and disturbed conditions. In particular the data corresponding to the geographic area of the American sector for the days 5-7 April 2000 have been used to perform a complete analysis of mapping function errors based on the "coinciding pierce point technique". The results clearly illustrate the electron density gradient effects according to the locations considered and to the actual levels of disturbance of the ionosphere.