



Planetary Wave Type Oscillations seen in ionospheric Total Electron Content

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Planetary waves (PW) are responsible for a large part of the middle atmosphere dynamics. They are supposed to impact the thermosphere-ionosphere system, too. The aim of the CAWSES project CPW-TEC is to find evidence for a measurable influence of PW on the Total Electron Content (TEC) of the ionosphere. TEC information is available from TEC maps of the high and middle latitudes which are regularly produced for more than 5 years at the DLR.

Assuming a transfer of PW energy up to thermospheric heights the ionosphere is used as an indicator for thermospheric dynamics and density variations. Empirical PW analyses on ionospheric and stratospheric data as well as related modelling studies are used to trace the vertical propagation of PW energy. Various planetary wave type oscillations (PWTO) can be proven in TEC. The variability of solar flux as well as ionospheric and geomagnetic storms were found to be the main drivers of these PWTO. The dominance of the solar influence makes it difficult to extract the probable middle atmosphere PW influence in the ionosphere. The source of the remaining PWTO is still unclear. A coexistence of PWTO in the ionosphere and PW in the middle atmosphere is only found on rare occasions and seems to be random. Modelling results indicate a possible upward penetration of the ultra-fast Kelvin and Rossby-gravity waves into the ionosphere at low latitudes, but could not explain the PWTO found at high latitudes. A possible mechanism to produce PWTO in the ionosphere is the modulation of gravity waves by PW that may be able to penetrate into the thermosphere.