



## **Global distribution of plasma irregularities in the lower ionosphere derived from GPS radio occultation data**

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In the ionospheric E-region occasionally appear patchy thin areas of enhanced electron density, so called sporadic E-layers in an altitude range between 90 and 120 km. Their global appearance is subject to strong daily and annual variations. Sporadic E-layers have a significant impact on radio wave propagation and related studies can be used to investigate vertical coupling processes between the neutral and ionised part of the atmosphere. The GPS radio occultation (RO) technique is used to study these plasma irregularities in the E-region on a global scale. The main advantages of the GPS occultation technique are global availability and high vertical resolution. Data received onboard three different RO missions, namely CHAMP, GRACE and COSMIC are used for our investigations. The data set comprises in maximum around 2,000 globally distributed high rate (50 Hz) occultation measurements per day. The upper altitude of the dual frequency GPS RO measurements (1.227 and 1.575 GHz) is located at about 130 km above the Earth's surface. Thus, these data contain information on irregularities in the E-region which cause strong fluctuations in the GPS signal amplitudes (signal-to-noise ratio) of the propagating GPS signals. This feature is used for detection of the presence of E-region disturbances. We present preliminary results of global climatologies of the occurrence of E-region irregularities based on seven years of CHAMP GPS RO data. We validate the satellite-based results with ground-based measurements from selected ionosonde stations.