Monitoring of Sporadic Plasma Layers in the Lower Ionosphere During Period 2001-2008 by use of GPS Occultation Data,

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Effects of radio waves propagation in the trans-ionospheric communication link satellite-to-satellite (refraction, diffraction, and scattering) are analysed by use of the high stability signals of GPS navigational system registered during radio occultation (RO) experiments. A classification of the ionospheric effect is introduced based on comparison of the amplitude variations and second derivative on time of the eikonal scintillations (eikonal acceleration) of RO signal. A coherent part of the amplitude and eikonal acceleration variations corresponds to effects of layered structures (refraction and diffraction), a decorrelated part is relevant to impact of small-scale irregularities (scattering and diffraction). In this contribution it is shown that (1) the S4 ndex of amplitude variations can be considered as an index of the ionospheric plasma influence on RO signal in the trans-ionospheric satellite-to-satellite links in a like fashion with the S4 index introduced formerly for the trans-ionospheric satellite-to-Earth links (2) the S4 index can be used in the satellite-to-satellite links as a radio-physical index of activity of plasma disturbances in the ionosphere; and (3) the relative number of GPS RO events with high values of the S4 index in the satellite-to-satellite links can be used to establish a connection between the intensity of plasma disturbances and solar activity. The general number of RO events with strong amplitude variations can be used as an indicator of the ionospheric activity. We found that during 2001-2008 the daily averaged S4 index measured during CHAllenging Minisatellite Payload (CHAMP) mission depends essentially on solar activity. The maximum occurred in January 2002, minimum has been observed in summer 2008. Different temporal behavior of S4 index has been detected for polar (with latitude greater than 60º) and low latitude (moderate and equatorial) regions. For polar regions S4 index is slowly decreasing with solar activity. Quasi-periodical oscillations (with time period of about 5-7 month) of the S4 index were detected which may correspond to possible impact of the solar wind and ultraviolet emission.