

The influence of solar Ly α and X radiation on the ionospheric D-region: the importance of determination of the quiet ionosphere parameters

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Solar radiation plays a very important role in photo-ionization processes in the ionospheric D-region. In the quiet conditions, hydrogen Ly α photons are the dominant source in the production of free electrons in the upper D-region, while the increase of X-ray flux during solar X-ray flares can cause very intense plasma disturbances of this atmospheric layer. In this paper, we present modelling of the quiet D-region electron density using the Quiet Ionospheric D-region (QionDR) model that incorporates variations in the influence of the Ly α photons during different periods of a solar cycle, year, and daytime. This model also allows more precise modeling of the perturbed D-region parameters during the influence of solar X-ray flares. Namely, a very important influence in this modeling has the determination of the quiet ionosphere parameters before perturbation. This study is based on D-region observations by very low / low frequency (VLF/LF) signals. In the presented analyse, we use the data recorded by the receiver located in Belgrade, Serbia, and related to the VLF signals emitted by the DHO and ICV transmitters from Germany and Italy, respectively.