

Variability of the Tropospheric-Delay Temporal Structure Function of Radio Signals from the Global Navigation Satellite Systems Versus Tropospheric Surface Layer Parameters

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Abstract

© 2016, Springer Science+Business Media New York. We present the results of a four-year (2009–2012) study of the decimeter radio wave propagation using signals from the global navigation satellite system (GNSS) and simultaneous measurements of the tropospheric surface layer parameters in the city of Kazan. Inter- and intra-annual variabilities of the temporal structure functions of the zenith tropospheric delay (ZTD) of decimeter radio waves are analyzed. It has been found that the contribution of irregularities with time scales of up to 24 h to the ZTD fluctuation variance varies, depending on the surface weather parameters (temperature and pressure). Correlation coefficient between the approximation exponents of the ZTD temporal structure function of decimeter radio waves and surface temperature reaches 0.77 for fluctuations with time scales of up to 8 h. It has been established that synoptic processes and the underlying surface affect the formation of mesoscale fluctuations on the phase path of radio signals from the navigation satellite systems.

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