



## **Fluctuations of the GPS signals on the tangential paths in the low terrestrial atmosphere: influence of the small-scale structure.**

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Both low stratosphere and troposphere of the Earth are characterized by complicated inhomogeneous structure of the refractive index field. This irregular structure results from turbulent flows, non-uniform distribution of the water vapor in the air, orographic perturbations of the wind flows and so on. Characteristic scales of these structure is on the order of hundreds of meters - units of kilometers, which is comparable to Fresnel zone size for GPS signals, while amplitude of the fluctuations of the refractivity may reach several N-units, i.e. units per cent of regular refractive index of the terrestrial atmosphere. First 3D reconstructions of small-scale water vapor fluctuations were recently published by various authors.

In this research, a model of irregular structure of the refractive index field has been formulated on the basis of the previously published observational results. The parabolic diffraction equation has been solved for the global cross-section through the inhomogeneous atmosphere (2D approximation). It has been shown that the diffractive effects of the small-scale structure play significant role in the formation of the wave field in the atmosphere. Amplitude fluctuations of the signal, caused by this small-scale structure of the low atmosphere, may be quite significant and comparable with the amplitude fluctuations due to ionospheric irregularities. On the other hand, these fluctuations do not result in complete degradation of the coherent structure of the signal field, observed at the low orbits of typical satellites, used for radio occultation observations. The influence of scattering of the signals by the terrestrial terrain has not been considered in the present work and is still to be studied.

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