

Influence nonuniformity of the atmospheric water vapor field on the phase measurements of radio signals from global navigation satellite systems

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Abstract

We present the experimental results for the horizontal gradients of integrated content of atmospheric water vapor, which are retrieved from the phase measurements of signals in the receiver network of the global navigation satellite systems in 2011 in the Republic of Tatarstan. The seasonal gradient variation is found. The meridional gradient usually shows a decrease in integrated water vapor with increasing latitude, and its monthly mean values are equal to -1.8 mm and 0.1 mm of precipitable water per 100 km in August and December, respectively. The zonal monthly average gradient is somewhat smaller in magnitude than the meridional one and is equal 0.1 mm and -0.8 mm per 100 km in March/June and May/October, respectively. Instantaneous values of the gradients can be an order of magnitude higher than the monthly mean values. Contribution from the gradient of integral water vapor to the phase-measurement difference between two antennas spaced 30 km apart is shown to attain its maximum of 141.5 mm in August for the zenith angle 80. Errors in determining the mutual location of the ground-based antennas of global navigation satellite systems due to the water vapor gradients can reach 66 mm and 16.9 mm in August and February, respectively. © 2013 Springer Science+Business Media New York.

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