

Implementation of GPS meteorology in Uzbekistan

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The number of permanent GNSS stations in Uzbekistan is increasing. Ulugh Beg Astronomical Institute is using the data of stations mainly for geodynamics. Since recent time, we are using the data in order to estimate precipitable water vapor in the troposphere using the method of GPS meteorology. At the first stage of the research we are using tropospheric zenith delays estimated by an online PPP services. The results show obvious daily and seasonal variations of the water vapor. Usage of simultaneous measurements of water vapor radiometer (WVR) is planned for calibration and validity check.

Keywords: GPS meteorology, tropospheric delay, wet delay, precipitable water vapor

GPS meteorology is a cost-effective method of quantitative estimation of the precipitable water vapour in the troposphere using GNSS signals. This method is being effectively used in many leading countries over the world as an additional source of information for weather forecast, climate change and water balance of the region.

The Ulugh Beg Astronomical institute has initiated an applied project for the implementation of the method in Uzbekistan. The project is going to use data coming from permanent GNSS stations installed in the country. The main partner of the project is GFZ-Potsdam, the German Centre for Geosciences which is going to install more permanent stations in Uzbekistan and the Central-Asian region.

GPS meteorology will be firstly used as an advanced method of weather forecast. Another future application can be Aral sea problem. Since Uzbekistan is located in the region vulnerable to ecological challenges caused by vanishing Aral, which can be regarded as an indicator of global climate change, there is a hydrological need to estimate potential precipitation in the Central Asian region as well as to model the water balance in the region.

I manage 2 GNSS stations in Uzbekistan. The stations installed by GeoForschungsZentrum, GFZ, Potsdam. I have an experience on water vapour content and total electron content estimations using Rinex-formatted data

coming from the stations.

We collaborate with GFZ-Potsdam in GNSS since mid 90ths. I am a responsible person for two GNSS stations in Uzbekistan. I have an experience on water vapour content and total electron content estimations using Rinex-formatted data coming from the stations. Since the beginning of this year I lead a new national applied project on remote sensing the tropospheric water using the data of our permanent GNSS stations. The results of the project will be used for weather forecast and climate change estimations.

The brief description of the method is following. A GPS station consisting antenna and receiver installed at an observatory receives the signals from satellites, signals travel through the atmosphere and affect with the turbulent properties of the atmosphere. Taking into account we can estimate the total number of water in the troposphere.

My institute has 2 applied projects dealing with remote sensing the atmosphere and formations on the surface of the Earth. Both of them use space technologies and satellite data for analysis. We recently initiated an applied project for the implementation of the method of GNSS meteorology in Uzbekistan. The project is going to use data coming from permanent GNSS stations installed in the country. I think that all of these projects will benefit from my participation. Since I am a head of one of the projects, I think the updates and new ideas coming from the symposium will be introduced to the projects.

My institute is going to begin a project on the estimations of water vapor content estimations using a GNSS station installed at an observatory. This is important on estimating the absorption of electromagnetic waves by water vapour at the atmosphere.