

True real-time monitoring of GPS precipitable water vapor over the Japanese Islands

Tetsuya Iwabuchi[1]; Christian Rocken[1]; Zdenek Lukes[1]; Leos Mervart[1]; James Johnson[1]; Masayuki Kanzaki[2]

[1] GPS Solutions Inc.; [2] NGS

<http://www.gps-solutions.com/~iwabuchi>

Continuous monitoring of water vapor is important not only for forecasting and nowcasting of severe rainfall but also for monitoring climate changes. A GPS processing of ground-based GPS stations can estimate zenith tropospheric delay (ZTD) and retrieve slant tropospheric delay, and those data has been used for forecast experiments and advanced researches such as water vapor tomography.

Since most of the GPS stations have now real-time streaming capability, we can monitor precipitable water vapor (PWV) every sampling epoch with much shorter latency (several seconds) than those called near real-time processing system. Most of the GPS processing software currently available usually requires time-window processing to estimate ZTD, and the final products of PWV are available at least 30 min. later of the observation.

We developed a true real-time GPS ZTD processing system based on RTNet software for rapid and frequent updates of integrated PWV over the GPS station. It estimates and updates ZTD every sampling epoch (from 1 sec. to 30 sec., depending on observation) with other parameters every time as soon as the data comes to a data server. It does not require time-window processing and can thus save significant computation time which is required in an overlapped time-window processing system.

The system focused on true real-time processing over the Japanese Island (GEONET) and it can be applicable to all GPS networks which have a real-time data capability in East-Asia. The system showed dense PWV distribution (about 17 km of mean GEONET spacing) and rapid water vapor variations every 30 seconds. Because PWV retrieved from the system has shown good agreement with post-processed PWV products using final GPS satellite/orbit products, the system is considered to be used for forecasting and nowcasting of severe rainfall, and researches on water budget with other and complement observations. We will also introduce possible application of the true real-time GPS PWV products for meteorology.