Impact of advanced ZTD estimate method (Part 2) –Comparison with PWV values by radiosonde observations –

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In the previous paper (Shimada et al., 2015), we propose the new procedure to estimate Zenith Total Delay (ZTD) to obtain GNSS Precipitable Water Vapor (GNSS PWV). In this procedure, we fix the accurate site coordinates in the estimation of ZTD to exclude the trade-off between the vertical coordinates simultaneously estimated in the conventional procedure. The proposed procedure is as follows:
In the first step of the procedure, we estimate daily site coordinates as well as hourly ZTD, every four-hourly atmospheric gradient, and independent ambiguities of all regional network sites as well as the IGS fiducial sites applying the GAMIT program. In the second step, we estimate the accurate present-day site coordinates, estimating from the recent 30-days' time series of the site coordinates solutions applying the Kalman filtering of the GLOBK program, constraining the IGS fiducial site coordinates. Then in the final step of the procedure, we estimate every hourly ZTD, as well as every four-hourly gradients of regional sites and independent ambiguities, fixing the site coordinates obtained in the second step.
In this paper we compare thus obtained GNSS PWV values with the radiosonde PWV observation values, as well as the GNSS PWV values estimated applyig the conventional method. We calculate GNSS PWV values of the GEONET 92110 (Tsukuba1) site and 93002 (Yasato) site using surface barometric and temperature values observed in JMA Aerological Observatory around 6km SSE of Tsukuba1 site and 24km SSW of Yasato1 site. The standard deviation of the difference between the Tsukuba1 site GNSS PWV and radiosonde PWV in Aerological Observatory, for instance, is 15.8mm in every 12h UT observations from March to December 2010, although the standard deviation by the conventional GNSS PWV and radiosonde PWV 17.8mm. Thus we conclude the proposed method estimates more precise PWV values compared with the conventional method.

Keywords: Zenith Total Delay, GNSS precipitable water vapor, Radiosonde precipitable water vapor