Estimation of local water vapor distribution with moving cell method using GPS campaign data

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In order to improve a positioning accuracy with GPS receivers, especially in an effect on water vapor fluctuation in the troposphere, and aim to estimate a local water vapor distribution with a horizontal scale of about 10 km, the dense-arrayed GPS observation was carried out during about one month in the autumn of 2000, and summer of 2001, respectively. In the both campaigns, total of 75 GPS receivers were arranged within a horizontal scale of about 15km around the MRI (Meteological Research Institute) in Tsukuba.

Hirahara[2000] estimated a local water vapor distribution with a horizontal scale of about 10 km using the 1995 Shigaraki GPS campaign data, which was similar to Tsukuba campaign except total of 25 GPS receiver and observational period of 2 days. The time and spatial resolution were 2 hours and few kilometers, respectively. We think that the time resolution is not enough to investigate meteological phenomena within a horizontal scale of 10 km. Therefore, we tried to improve time resolution up to 10 min. or so with he moving cell method, which Sekoet.al. [2000] used for estimation of water vapor distribution with horizontal scale of about few 100 km around a Baiu front.

We developed tomographeric technique for local water vapor distribution with moving cell, and verified it using simple three-dimensional water vapor distribution models. As a result, we successfully estimate water vapor distribution with a time and spatial resolution of 10 minutes and a few km, respectively. From this simulation, we decided parameters of tomography analysis for the actual observation data, which was observed 0:00-0:50 on October 25, 2000. In consequence, we obtained stabilize solution and it consisted with raman LIDAR(Light Detection And Ranging) observation at MRI.