Computation and Analysis of Antenna and Multipath Characteristics of Permanent GPS Stations

Van der Marel, H.

Delft University of Technology - DEOS, NETHERLANDS

Site dependent carrier phase multipath and elevation dependent antenna phase centre variations of permanent GPS stations are investigated using the least squares residuals from the GPS data analysis.

First, a method is presented to compute un-differences least squares residuals and its covariance matrix in case of single or double differenced processing. Residual stacking code has been developed in Matlab to estimate site dependent multipath, antenna phase centre variations, and elevation standard deviation of the receivers, using the un-differenced residuals. The multipath maps are updated on a daily basis based on data from the previous days, and then used to correct the GPS observations of the next day.

Investigations have been carried out for several IGS and EUREF sites. Very significant site and antenna related effects were found, which after correction, improved the GPS observations considerably. Also, for different receiver types, different elevation dependent standard deviations were found. Back-substitution of the multipath corrections into the GPS processing led to a small improvement in estimates of position, in particular the height component, and tropospheric zenith delays. Furthermore, residual stacking proofed to be a very useful tool in detecting and diagnosing problems in the processing and with the stations.