Geophysical Research Abstracts, Vol. 7, 06124, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06124

Determination of a realistic Precision Measure for Integrated Precipitable Water Vapour Values in the Area of the Antarctic Peninsula

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The earth's atmosphere, especially the water vapour of the electrical neutral atmosphere, affects the precision and the accuracy of satellite-based point positioning. Thus, water vapour is a limiting factor for GNSS applications (e.g. GPS). Within the related literature this phenomenon is usually called tropospheric refraction. For precise point positioning applications using GPS, one has to model and estimate the tropospheric refraction in order to guarantee results of highest quality.

In the framework of a case study, continuously observed GPS data collected at several sites in the area of the Antarctic Peninsula are used to evaluate a realistic measure for the precision and the accuracy of GPS-based integrated precipitable water vapour estimates. As external references NCEP Reanalysis and radiosonde data are used.

Beyond the possibility of using modelled and in-situ measured meteorological data for the validation of GPS results, the different effects of atmospheric parameters and their application in calculating the tropospheric models were carefully checked out. Sensitivity studies reveal that factors with strongest impact on accuracy of integrated water vapour are presented.

Furthermore, the effort of obtaining reliable estimations of precipitable water by means of GPS will be an additional source to improve the knowledge about climate variability in the Antarctic which is still affected by the small quantity and less precise quality of the meteorological observations.