



## **The effect of increasing height difference on GNSS baseline solutions from commercially available software**

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In this study, the effect of the large height difference on commercially available GNSS baseline solutions is tested. In addition, comparisons to academic software results are provided. Previously the effect of the large height difference was tested on GIPSY relative-PPP results. A sub-network of the IGS consisting of 26 baselines was chosen and the height difference between baseline points was gradually incremented up to about 1650 m. Varying observation sessions of 1-24 hours were generated and processed using the continuous data of the IGS stations. The baseline length between ground stations was around 10 km. Atmosphere related errors over this scale cancel out with relative positioning when there is no height difference between baseline points. Within the frame of this study, we almost adopted the similar experiment design. Differently, we processed the GNSS data using the commercially available Topcon Magnet, v. 4.0.1 software. The results reveal that in terms of horizontal positioning, both the research and commercial software produce more or less similar results. In terms of vertical positioning, as expected, the results of commercially available software are far poorer than those of the research software. Obviously not estimating the troposphere, i.e. using only a standard troposphere model, adversely affected the results of vertical positioning. The biggest impact was on the finding that the accuracy of vertical positioning ranged between 20-90 millimetre over similar scales even if the observation session was extended up to 24 h. This would probably break the routine of monitoring high structures over local scales with only a couple of hours of observation sessions and commercial software with a high expectation of precision results.