The Effect of Multiple Baseline Evaluation with Commercial Software on GPS Position Accuracy

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The evaluation of the observation data obtained from the GPS system is performed with software. The software used today is divided into academic, web-based and commercial software. Researches generally focus on academic software and web-based services that have become widespread in recent years. Commercial software is often used by daily users, mostly in classical geodesy. These softwares differ from each other; users, their purpose of use, processing methods, accuracy, users knowledge level etc. In this study, we focused commercial software's (Topcon Magnet version 4.0.1) accuracy of GPS positioning in single and multiple base solutions.

10 stations included in IGS network in California, USA, one base and 2, 3 and 4 network solution results in different session times (1h to 24h) positioning accuracy was achieved. In our study, it has been found that the accuracy obtained for the horizontal components North and East varies between 2 mm and 8 mm and vertical component Up varies between 3 mm and 54 mm.

In evaluations with a reference station distance of up to 100km, increasing the number of more than 2 reference stations (3 or 4) for horizontal components (North and East) did not make a significant contribution to accuracy. In the case of vertical component (Up) accuracy, it is determined that accuracy is affected by interstation distance and observation time more than the number of reference stations(1, 2, 3 or 4). It was found that it was meaningful to increase the accuracy of the vertical component to be observation time for as long as possible and reference base stations to be selected from the closest possible stations. Avoidance of short observation time (1 hour and less) for all three components was found to be important in terms of accuracy to be achieved.

\textbf{Keywords:} Commercial software, GPS, Multiple base solution.