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Performance of ultra-fast positioning supported by GBAS: ASG-EUPOS case study with unfavorable network-user geometry

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In ultra-fast static satellite positioning successful ambiguity resolution mostly depends on the accuracy of the applied atmospheric – ionospheric and tropospheric - corrections. In case of Ground Based Augmentation Systems (GBAS), such corrections are usually derived from the reference network solution, and subsequently provided to the user. The accuracy of these corrections is a function of spatial and temporal variability of the ionosphere and the troposphere, average distance between GBAS stations, and also depends on the location of the user with respect to the reference network - the solution geometry. However, in some scenarios, such as positioning in areas around the GBAS network borders, a favorable geometry cannot be accomplished.
In 2008 Polish Head Office of Geodesy and Cartography established multifunctional GBAS system – ASG-EUPOS. This system is built according to European Position Determination (EUPOS) system standards and offers a variety of positioning services. In 2010 ASG+ project was launched aiming and improving the existing services of ASG-EUPOS system. One of the tasks in this project is the development of automatic, web-based ultra-fast positioning module. This module will provide the users static position based on five minutes of GNSS data collected anywhere within the network. ASG-EUPOS system shares its data with systems in several neighboring countries, therefore supporting corrections and positioning up to Polish borders. However in case of countries with no GBAS networks or shore areas there are regions where the corrections need to be extrapolated.
The goal of this paper is to analyze the ultra-fast positioning accuracy and reliability in case of unfavorable solution geometry with the user located at different distances outside the reference station network. GPS data collected at several test locations were processed using the developed positioning module. The results show that in networks with average distances between the reference stations of 70 km, it is possible to provide accurate and reliable position as far as 60 km outside the network borders.