Precise Point Positioning (PPP) Technique versus Network RTK GNSS

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SUMMARY

Major developments in the world of informatics have led to the creation of different solutions with various algorithms and major changes in numerous professional fields as well as in GPS surveying. One of which is Network RTK used extensively in the world producing economical and rapid solutions to the users. Network RTK systems have been set up to provide data collection, processing and transmitted to users. These networks have been established in many countries all over the world and used extensively. The Network RTK similar to the all the other differential methods need additional data from a reference station. Over the past decade, researchers have made studies to develop more economical, more convenient, more reliable, and worldwide precise positioning solutions, which do not have the disadvantages that exist in the conventional differential GNSS techniques including Network RTK. One of the commonly used methods is Precise Point Positioning (PPP). PPP provides positioning without the need for a reference station using a stand-alone GNSS receiver.

The aim of this study is to make an accuracy comparison of the Network RTK and the PPP techniques in a dynamic environment. In order to assess the accuracy performance of the techniques, a kinematic trial measurement was carried out at the Obruk Lake Dam, Çorum, Turkey in September of 2015. The coordinates of the vessel were recorded from the TUSAGA-Aktif network in real-time. The collected data in kinematic trial were sent to a commonly used on-line processing service, Canadian Spatial Reference System-Precise Point Positioning Service (CSRS-PPP) operated by Geodetic Survey Division of Natural Resources Canada (NRCan) and PPP-derived coordinates were obtained. The Network RTK and PPP-derived coordinates were compared with those of differential technique results, i.e. to the reference coordinates, epoch-by-epoch.

The results show that the Network RTK provides a cm-level of accuracy when the solution can be fixed. Concerning the PPP technique, the kinematic test results showed that the PPP-derived coordinates converge to the relative solutions with also cm-level of accuracy. In general, it concludes that both of the techniques can be used for the several marine applications as a strong alternative to the conventional differential methods. However, the Network RTK results show that the accuracy decreases dramatically to even a meter-level of accuracy if the fixed solution was not provided. In this study, the test procedures and their results are discussed.