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Efficiency of the Multi-GNSS Precise Point Positioning Solutions

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Global Navigation Satellite Systems (GNSS) are used for many applications in geodesy. In recent years, Precise Point Positioning (PPP) technique, which does not need any reference station, has been preferred instead of the relative positioning technique for scientific researches and engineering applications. Although PPP technique reduces the equipment costs and simplifies the field work, it requires long convergence time to obtain centimeter level positioning. The international GNSS service (IGS) is the one of the most important organizations that has great effort to ensure high-quality GNSS data products. IGS has set up the Multi-GNSS Experiment (MGEX) to track, collate and analyze all available GNSS signals. In this study, the impact of the combining GPS, GLONASS, Galileo and BeiDou systems has been examined on the efficiencies of the PPP positioning solutions. For this aim, MGEX stations which include GPS, GLONASS, Galileo and BeiDou measurements have been specified and the performance of the PPP technique in static mode has been analyzed. Eight different scenarios have been considered as: GPS-only, combined GPS/GLONASS, combined GPS/Galileo, combined GPS/BeiDou, combined GPS/GLONASS/BeiDou, combined GPS/GLONASS/Galileo, combined GPS/Galileo/BeiDou and combined GPS/GLONASS/Galileo/BeiDou. The GNSS measurements have been processed with RTKLIB software. As a result, it has been exposed that the efficiency of the PPP solutions changes depending on the combination of the different systems.