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GNSS-based determination of High Frequency Earth Rotation Parameters utilizing GPS + Galileo observation data

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Based on IGS MGEX observation data the potential of recent GNSS observations for determination of Earth rotation parameters (ERP) at sub-daily periods with the high precision currently achieved by this technique has been investigated. Techniques, based on GPS observations are currently the most important techniques to derive pole coordinates x, y and also provide high quality Length Of Day (LOD) estimates. Other GNSS measurements, such as those from Galileo, might be combined with GPS data to improve the precision of the parameter determination.

Utilizing the Bernese GNSS Software v.5.2, we have analyzed a period of 6 months (February 2017 until July 2017) with a minimum number of 6 and a maximum number of 15 active Galileo satellites in contrast to the complete GPS constellation. Precise GPS+Galileo orbits were retrieved from the public ESA/ESOC archive (http://navigation-office.esa.int/products/gnss-products/) for this period. The daily orbital fit of the Galileo FOC satellites is at the +/-2cm level. The employed GNSS network comprised about 130 regular GPS sites of the IGS network plus 30 sites of the MGEX network tracking also Galileo satellites. For about 75 stable sites, a NNR constraint to their ITRF2014 coordinates has been applied. Hourly ERPs were derived with respect to the sub-daily ERP IERS reference model IERS2010XY, considering the corresponding nutation model IAU200R06, as well as the Ocean tidal loading model FES2004.

This presentation discusses the quality of the achieved multi-GNSS ERP solution in the high frequency domain and details differences to a GPS-only solution as well as to the reference model. Moreover we investigate the influence of different parametrizations of the tropospheric delay on the estimated Earth Rotation Parameters.