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Long- and short-period errors in GNSS coordinate time series

Kibrom Ebuy Abraha (1), Felix Norman Teferle (1), Addisu Hunegnaw (1), and Rolf Dach (2)

(1) Institute of Geodesy and Geophysics, University of Luxembourg, L-1359 Luxembourg. Email:kibrom.abraha@uni.lu, (2) Astronomical Institute, University of Bern, Sidlerstrasse 5, CH-3012 Bern, Switzerland

Global Navigation Satellite System (GNSS) coordinate time series are used to infer non-linear motions induced by geophysical signals. Low- and high-frequency spurious signals affect the GNSS coordinate time series, which may then lead to erroneous interpretations of real geophysical processes. These spurious signals are caused due to un-modelled long-period and/or propagation of sub-daily signals into the time series. Single- and combined-GNSS Precise point Positioning (PPP) solutions on a global set of stations are used to investigate the unmodelled (periodic) signals in the coordinate time series. In this study, Global Positioning System (GPS)-only, GLObalnaya NAvigatsionnaya Sputnikovaya Sistema (GLONASS)-only, and combined GPS+GLONASS solutions are considered. The GPS-only and GLONASS-only solutions contain system specific short and long-period spurious signals, while the powers of the periods are reduced in the combined solution. We show that an evolving (GLONASS) constellation contributes to the powers at some of the frequencies. The study also demonstrates that aliases of (semi-) diurnal errors into longer periods are highly sensitive to GNSS constellation dynamics and orbit-repeats in-addition to under-sampling effects.