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Spectral Character of Repeated GPS Measurements

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We need GPS campaigns because we are not always able to monitor natural hazards using CORS. Prime examples in regard to the above statement are landslides and local subsidence. For instance, we are reluctant to install permanent GPS equipment in a landslide area because the equipment might be destroyed due to the sudden flow of the ground. Similarly, the CORS might not be covering the area in which a local subsidence happening. Obviously more examples can be given. We take repeated (campaign) GPS to such case study areas. Therefore, similar to the continuous GPS, we also need to study the properties of the repeated GPS. Upto now, the positioning accuracy and the accuracy of velocity estimation have been documented well for the repeated measurements. The spectral character is one such issue that we desire to look along with the other investigations. Thanks to the IGS and its data and analysis center SOPAC, we are able to simulate possible campaign senarios and apply variety of statistics using their products. Thanks also to NASA, JPL; using the PPP module of GIPSY/OASIS II software, we are able to study the direct absolute deformations of the earth at the mm level. These investigations should shed light into multi-GNSS experiments. We generate monthly sampled GPS campaigns from the continuous IGS data and estimate station velocities from repeated GPS measurements. Then, we test the statistical significancy of the estimated trends against SOPAC derived station velocities. The analysis procedure includes the computation of periodograms for the campaign solutions and determine significant periodicities in the data. We ceheck the obtained periodicities with those of the SOPAC time series analysis of the continuous GPS data. As might be expected, the spectral character of the campaign solutions differ from those of the daily sampled continuous GPS solutions implemented by SOPAC. For instance, the typical annual signal on the vertical componenet might disappear at some stations, leaving usually a pure white noise. In such a case, we apply various filtering strategies to improve the significancy of the deformation rate in comparison to SOPAC estimates. This is sudied for a global network of IGS stations, and the conclusions are shared.