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Satellite Clock Product Generation for Long-Term Monitoring of Land Movements Using GNSS

OY Alhamadani, FN Teferle, and RM Bingley

University of Nottingham, Institute of Engineering Surveying and Space Geodesy, Nottingham, United Kingdom
(isxoza@nottingham.ac.uk / +441159513881)

The application of GNSS to the long-term monitoring of land movements is based on producing daily time series of the change in station positions over a period of time. Such time series can be produced very efficiently by using Precise Point Positioning (PPP) techniques, in software such as GIPSY/OASIS-II and Bernese (BSW5.0). However, these rely on the availability of precise satellite orbit and clock, and Earth rotation products. Since 1992, the IGS has provided high quality products in support of GNSS for Earth science research and applications. In addition, since November 2006 there have been significant improvements in these through the development of updated models for absolute satellite and receiver antenna phase centers and the computation of atmospheric delays. For the long term monitoring of land movements, it is essential that any such developments can also be used to produce improved products that go back in time, to enable the homogeneous re-processing of archived observation data. For this reason, an IGS re-analysis effort is currently underway. In the mean time, some improved products have been made available by one IGS Analysis Center, GFZ in Germany, which used BSW5.0 but only made available satellite orbits and Earth rotation parameters, and not satellite clocks. In this study, we produce a series of re-analyzed satellite clocks that are compatible with the GFZ re-analyzed satellite orbits and Earth rotation parameters. For this effort, BSW5.0 was employed with a global network of 100 plus IGS stations. Our results are presented as a series of tests assessing the quality of the re-analyzed satellite clocks and the quality of the PPP solutions obtained when using these. These preliminary results are the initial phase of our intention to carry out our own re-analysis to produce improved satellite orbit and clock products using BSW5.0, to enable a homogeneous re-processing of archived observation data using PPP and BSW5.0 for the study of vertical land movements in the UK.