Combination and long term stability of the IGS Reprocessing campaign

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During the relatively short life of the Global Positioning System (GPS) there have been several changes to the analysis procedure, leading to inhomogeneous coordinate time series. Although they have reduced systematic errors in more recent solutions, these changes have modified the apparent periodic signals observed and led to spurious discontinuities.

The International GNSS Service (IGS) reprocessing campaign uses the latest operational models and techniques to reprocess the back catalogue of GPS data to produce remove inconsistencies caused by the various model changes, thus producing a homogeneous time series of station coordinates and Earth Rotation Parameters (ERPs). Weekly coordinate and ERP solutions from up to 11 reprocessing analysis centres (ACs) have been aligned to the ITRF and combined using the TANYA software in a rigorous weighted least-squares solution.

Analysis of the time series of station coordinates and Helmert transformation parameters between the combined solution and the ITRF shows a at least a 50 percent improvement in the stability of the reprocessed weekly solutions compared with earlier operational products. There is a gradual decrease in the weighted root mean square coordinate difference, both between the combined weekly solutions and the ITRF and between the individual AC solutions and their weekly combination, which reaches a minimum around the end of 2005 with a slight increase thereafter. We observe clear differences in the periodicity of Helmert transformation parameters between the individual AC solutions and the combined solution, which presumably result from variations in AC processing strategy. There is a clear annual or near annual periodic variation in the scale difference between the combined solution and the ITRF05 and some less clear variation between the translation parameters, which needs further analysis as to its cause.

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