IGS08: Elaboration, consequences and maintenance of the IGS realization of ITRF2008

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The International GNSS Service (IGS) has designated its own realization of ITRF2008, known as IGS08, as the basis of its products starting in early 2011 and for the next full reprocessing campaign. The philosophy generally follows IGS practice since 2000 when the IGS97 realization of ITRF97 was adopted. However, unlike frames IGS97 through IGS05, IGS08 was initially intended to be a direct subset of well performing, stable GNSS stations from ITRF2008 rather than a separate GNSS-only frame solution. But, while the IGS contribution to ITRF2008 was computed using the original set of "absolute" GNSS antenna calibrations (igs05.atx), IGS08 had to be consistent with the latest set of calibrations (igs08.atx) that includes new determinations for some existing antennas. Coordinate corrections due to the antenna calibration updates were thus estimated and applied when possible to the ITRF2008 coordinates of 64 affected stations (out of a total of 232 stations in IGS08).

As regards GNSS, the scale of the terrestrial frame is highly correlated with the satellite phase center offsets (PCOs) in the radial Earth direction. As the ITRF2008 scale differs by about -1 ppb from ITRF2005, new satellite PCOs consistent with ITRF2008 and IGS08 had to be derived for igs08.atx. They were obtained by back-solving the reprocessed solutions of five IGS analysis centers, while fixing their scales to the ITRF2008 scale.

In order to satisfy regional users, many reference stations were selected in areas with dense GNSS coverage, such as Europe. This led to density heterogeneities in the IGS08 network, which is not optimal for the alignment of global frames. So a smaller, well distributed core network was additionally defined and recommended for global applications (such as for the IGS core products). Simulations show that using this core network instead of the full IGS08 set as reference frame indeed significantly reduces the "network effect".

Transformation parameters from IGS05 to IGS08 are unsurprisingly close to those from ITRF2005 to ITRF2008. Rotations are at the level of 0.01 mas so that the IGS orbits and Earth orientation parameters should be marginally affected by the switch from IGS05 to IGS08. But the scale difference of $\sim$ -1 ppb and the Z translation of $\sim$6 mm will result in changes in station positions by several millimeters.

IGS08 is already beginning to suffer from continuous loss of reference stations due to earthquakes and mainly antenna changes, as was an even more critical problem for IGS05. To avoid a future crisis situation for the IGS products, it might be necessary to consider regular updates of the IGS08 reference frame before the next ITRF release. Such updates would require updated, post-discontinuity IGS08 coordinates to be estimated. A method to obtain such updated reference coordinates, based on the IGS operational cumulative solution, will be proposed.