

Coordinate Transformations between GDA94 and the ITRF

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SUMMARY

The Geocentric Datum of Australia 1994 (GDA94) is a static coordinate datum realised with respect to the International Terrestrial Reference Frame (ITRF) at the reference epoch of 1 January 1994. At this time GDA94 and ITRF were coincident, however, as a consequence of the tectonic motion of the rigid Australian plate, ongoing refinement of the ITRF, and crustal deformation, the two reference frames have diverged, and the absolute difference between them is now approximately 1 m. Consequently, precise coordinate transformations between ITRF and GDA94 are required for many applications within the Australian spatial community, and in this study we review, improve and extend these transformations. We have computed new Helmert transformation parameters between ITRF and GDA94, including the specific ITRF realisations of ITRF1996, ITRF1997, ITRF2005 and ITRF2008. For the ITRF2005 and ITRF2008 cases these are the first available results. After transformation, we find ITRF based network solutions have residual coordinate differences with respect to GDA94 that are typically less than 10 and 30 mm in the horizontal and vertical components, respectively. However, maximum residuals can exceed 15 and 70 mm in the horizontal and vertical components, respectively, which highlights a limitation of GDA94 for many precise applications. Finally, we discuss implications and future strategies for managing the differences between GDA94 and ITRF, including novel coordinate transformation approaches, satellite trajectory transformations, and also options for the modernisation of the Australian geodetic datum.

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