

Precision Analysis of GPS for Datum Modernisation in Australia

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SUMMARY

An increasingly important requirement for Australia's geodetic reference system is that the relationships between the International Terrestrial Reference Frame (ITRF) and the national horizontal and vertical datums are well understood. To support the development of improved geodetic infrastructure in Australia, we have analysed GPS data observed at 2310 survey marks. These data, observed between 1995 and 2009, across continental Australia were processed with consistent standards to generate a combined solution with an estimated uncertainty of better than 5 and 20 mm (1 sigma) in the horizontal and vertical components, respectively. Our combined solution, which was mapped to ITRF2005 at the reference epoch of 2000, is the first unified single-epoch solution with sufficient resolution to support datum modernisation in Australia. We review the considerable work undertaken to determine the optimum analysis procedure, including comparisons of solutions using different antenna phase centre variations (PCV) calibration models, and find that the heights determined using relative PCV models differ from those determined using absolute PCV models by a maximum of 27 mm and an average of 6 mm. Also, we assess the impact of both observation session lengths and crustal velocity modelling. There will be two important applications for this new GPS solution. First, will be the development of an improved model for the estimation of Australian Height Datum (AHD) values from GNSS observations, and the solution will be an important input into the Australian Height Modernisation Project. Second, will be its use as constraining dataset for the readjustment of the terrestrial geodetic observations used in GDA94 as part of the creation of the Geodetic Model of Australia, and will potentially lead to a new national datum.

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