AUSGeoid09: Improving the Access to Australia's Vertical Datum

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SUMMARY

Geoid09 now allows GPS users to derive Australian Height Datum 1971 (AHD71) heights more directly from ellipsoidal heights. Unlike previous versions of AUSGeoid ('93, '98) which were gravimetric only quasigeoids, AUSGeoid09 is a combined gravimetric – geometric quasigeoid providing height separation values from ITRF to AHD71. This allows for the more direct determination of AHD heights from GPS surveys, and avoids the need for post-survey adjustments AUSGeoid09 consists of two components combined together into a single national grid at a 1'x1' resolution between 108E and 160E and 8S and 48S. The first is the gridded offset between the latest gravimetric quasigeoid (referred to as AG09grav) and AHD71. This offset is predominantly caused by sea surface topography including the differential heating of the oceans. The warmer / less dense water off the coast of northern Australia is approximately 1 m higher than the cooler / denser water off the coast of southern Australia. The second component is the gravimetric-only quasigeoid model produced by the Western Australian Centre for Geodesy at Curtin University. This provides the gridded height offset between the ITRF and the quasigeoid surface. The optimal offset grid between AG09grav and AHD71 was calculated by empirical testing using a cross validation least squares technique. The primary dataset comprises of ~1000 points with accurate ellipsoidal height and published third order or better AHD71 heights. A secondary dataset of ~4250 junction points, for which AHD71 heights are available, were also used in the analysis to model the localised AHD71 variations across the continent. All input data points were independently weighted according to GPS processing results, known levelling uncertainties and the inaccuracies of the horizontal positions of the junction points. The AUSGeoid09 product allows users to interrogate the combined gravimetric - geometric quasigeoid model using GDA94 horizontal coordinates at a specified location. The output is the offset from the ITRF2005@2000 ellipsoidal height to the AHD71 height with accuracy well within the uncertainty of the existing AHD71. AUSGeoid09 allows GPS users to establish more accurate AHD vertical control in remote areas of Australia, assist with natural hazard modelling and improve the vertical accuracy of airborne and spaceborne imagery by aligning them with Australia's national vertical datum.

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