T1

GDA94 to GDA2020 transformation grids

Transformation grids provide users of spatial data with a simple and nationally consistent method of transforming data between reference frames. Two transformation grids have been developed by the Intergovernmental Committee on Surveying and Mapping (ICSM) to transform data from GDA94 to GDA2020.

The difference between GDA94 and GDA2020 coordinates is comprised of a conformal transformation component primarily due to plate tectonic motion (Figure 1), and an irregular (non-conformal) distortion component. The conformal component accounts for the primary coordinate movement between GDA94 and GDA2020, and replicates a seven-parameter similarity transformation.

The distortion component is attributable to several second-order effects, such as an improved realisation of the global reference frame over time; irregular ground movement since GDA94 was established; and improvements in computation methods since GDA94. These effects vary in magnitude and direction around the country and can be as large as ~0.5 m.

The transformation grids

1. Conformal: predominantly plate tectonic motion (~1.7 m NNE) and replicates a seven-parameter similarity transformation.
2. Conformal + Distortion: includes regional distortion from second-order effects (see above).

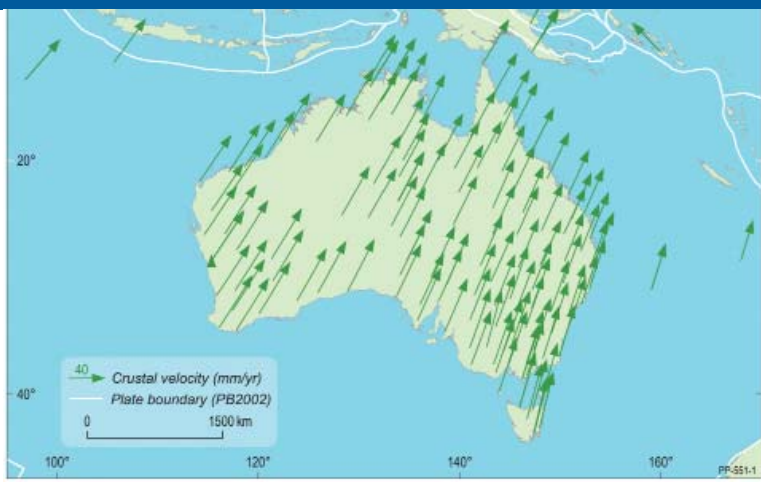

Figure 1. The difference between GDA94 and GDA2020 coordinates is primarily due to tectonic plate motion.

Which grid should I use?

Conformal grid

If GDA94 coordinates were observed using Global Navigation Satellite System (GNSS) technology, with corrections coming from a network of GNSS reference stations (such as GPSnet, CORSnet-NSW), it is likely that the coordinates will be unaffected by local distortions. In this case, the Conformal grid or a seven-parameter similarity transformation would be most suitable to transform the GDA94 coordinates to GDA2020.

Conformal + Distortion grid

If survey control marks were used for referencing and/or establishing GDA94 coordinates, localised distortion will need to be taken into account. In this case, the Conformal + Distortion grid should be used to transform to GDA2020 coordinates. If in doubt, contact your state or territory land survey authority.

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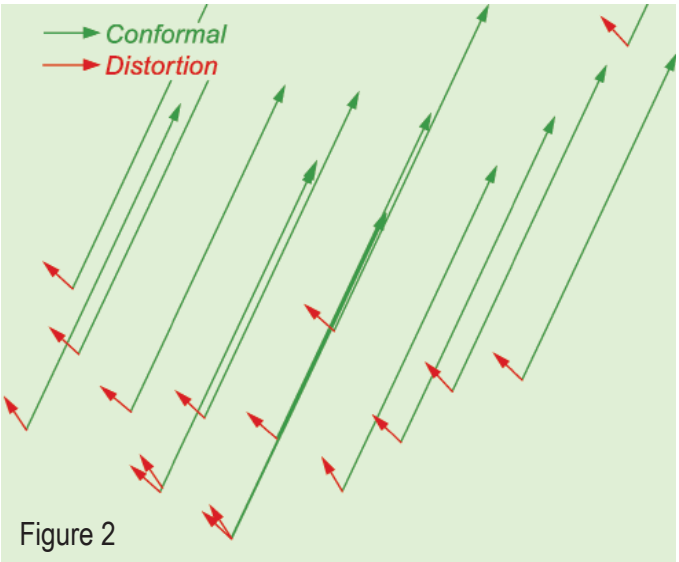

Figure 2

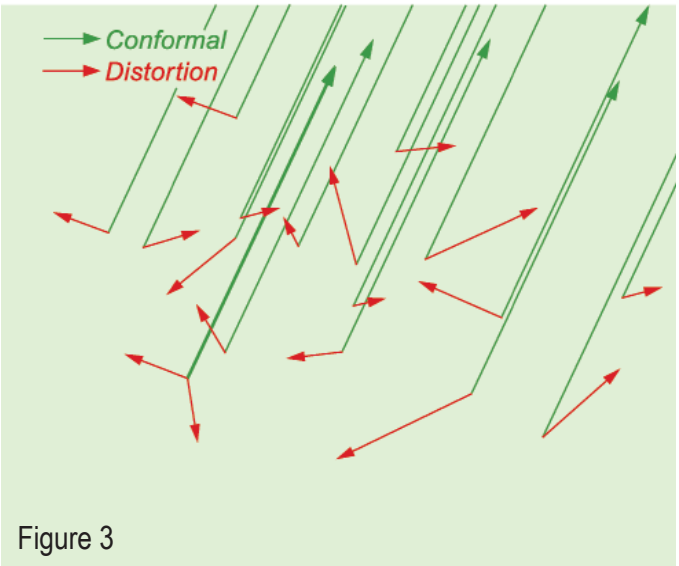

Figure 3

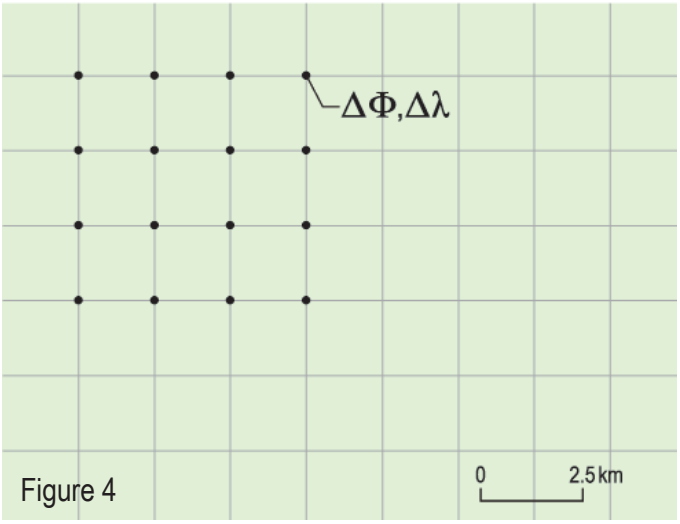

Figure 4

Figure 2. Conformal (green) and distortion (red: high reliability) components of the transformation grids. Figure 3. Low reliability. Figure 4. The grid has latitude and longitude components.

How the grids were developed

The grids were developed using more than 170,000 points at which both GDA94 and GDA2020 coordinates were available. The seven-parameter similarity transformation was modelled across the grid and designated the conformal component. The GDA94 coordinates were then passed through the conformal grid and compared against the nationally-adjusted GDA2020 coordinates to estimate the distortion at every point.

In some regions the distortion component is regular (Figure 2) with a similar magnitude and direction, while in other cases it is irregular (Figure 3) with a different magnitude and/or direction. In regions with an irregular distortion component, the transformation grid will be less reliable.

After removing the conformal component, a distance-weighted interpolation technique was used to compute the distortion in latitude (Δφ) and longitude (Δλ) on a regular 1' grid (Figure 4). The conformal component was then added back to each grid point to complete the Conformal + Distortion grid.

Where to get the grids

The transformation grids are available from the ICSM website: http://www.icsm.gov.au/gda/grids.html

Further information

For further information on the development of transformation grids, refer to the *Geocentric Datum of Australia 2020 Technical Manual*: http://www.icsm.gov.au/gda/tech.html

Information about the datum modernisation – including a simple explantory animation, frequently asked questions, fact sheets, technical guidance and progress updates – is available on the ICSM website: www.icsm.gov.au