

## Analysis of the New South-West Seismic Zone Geodetic-GPS Monitoring Network

<b>Degree:</b>	MSc (by research)
<b>Keywords:</b>	geodesy, geodetic networks, GPS, Internet, Geocentric Datum of Australia
<b>Entry:</b>	Bachelors, preferably 1st class Honours, Postgraduate Diploma or Masters degree in geoscience, physics, mathematics, or any related discipline
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<b>Project Funding:</b>	Western Australian Centre for Geodesy
<b>Student Funding:</b>	The student will receive some assistance with the costs of thesis production and photocopying
<b>Resources:</b>	GPS equipment, previous GPS-terrestrial monitoring data
<b>Collaboration:</b>	Western Australian Department of Land Administration, Geoscience Australia
<b>Starting Date:</b>	Unrestricted

### Project Description:

The south-west seismic zone (SWSZ) in south-west Western Australia is a belt that exhibits significant intra-plate earthquake activity. Its proximity to Perth presents a significant seismic hazard to the infrastructure and population. Since the 1968 Meckering earthquake, terrestrial and GPS-based geodetic monitoring has been conducted over part of the SWSZ. However, the data are of variable quality and give contradictory results (i.e., some data show extension, whereas other data over the same baselines indicate compression) (eg. Featherstone, 1998).

In May 2002, a new GPS network was observed over the SWSZ, funded by Geoscience Australia (formerly the Australian Geological Survey Organisation) and the Western Australian Department of Land Administration. The student will compare the new baseline lengths with those observed episodically over the previous 30 years. This reprocessing will use standard geodetic processing packages (eg. Trimble, Bernese, AutoGIPSY, and AUSLIG's on-line GPS processing service) to derive coordinates from the new GPS surveys with previous data to attempt to detect significant deformations. Previous processing of earlier data shows that these were of poor quality, so the student will also attempt to determine the source of these problems. However, the principal aim is to compare the new 50-point network with previous survey data.

The outcome of this project will help determine if there is any detectable motion (i.e., the motions are significantly larger than the errors associated with the measurements). This is of importance since any

earthquake occurring in this region will have a great impact on the population of Perth. This research has already attracted a great deal of media attention, so get ready for TV and radio interviews!

**Further reading:**

- Coleman, R. and Lambeck, K. (1983) Crustal motion in south eastern Australia: is there evidence for it? *Australian Journal of Geodesy, Photogrammetry and Surveying*, 39, 1-26.
- Downes, D.P. (1998) Geodetic investigation of crustal deformation in the south-west seismic zone. BSurv(Honours) dissertation, School of Spatial Sciences, Curtin University of Technology, Perth.
- Downes, D.P., W.E. Featherstone, M.C. Dentith and R. McCarthy (1998) Surface expression of deformation in the South-West Seismic Zone: is there evidence of it and strategies for its detection using satellite geodetic techniques?, proceedings of Meckering Thirty Years On, Perth, Australia, November, 5.1-5.4.
- Dentith, M.C. and W.E. Featherstone (in preparation) Towards an understanding of the seismicity in the southwest of Western Australia, *Australian Journal of Earth Sciences*.
- Featherstone, W.E. and M.C. Denith (unpublished) Analysis of repeat-geodetic measurements in the south-west seismic zone, Western Australia, Curtin University of Technology.
- Featherstone, W.E. (1998) Geodetic monitoring of the South West Seismic Zone, in: *Advances in GPS Deformation Monitoring*, School of Spatial Sciences, Curtin University of Technology, 43-62.
- Larson, K.M. and Agnew, D.C. (1991) Application of the Global Positioning System to crustal deformation measurement: precision and accuracy. *Journal of Geophysical Research*, 96(B5), 16547-16565.
- Savage, J.C., Lisowsky, M. & Prescott, W.H. (1996) Observed discrepancy between Geodolite and GPS distance measurements. *Journal of Geophysical Research*, 101(B11), 25547-25552.