

**WHY DO WE NEED DETAILED GRAVITY OVER CONTINENTS:
SOME AUSTRALIAN EXAMPLES**

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Apart from terrain elevations the only geophysical quantities that are generally available over a continent are gravity and components of the magnetic field. Hence direct inferences on crustal structure are difficult to make and strongly dependent on mechanical assumptions made. For example assumptions concerning the isostatic state. The data for Australia represents one of the best continental scale gravity surveys and provides some useful examples of what conclusions can be drawn from such data. The gravity anomalies are generally bland over the continent and this is in keeping with the notion that stress relaxation and erosion and rebound have been instrumental in reducing non-hydrostatic stresses. Notable exceptions, however, occur. In central Australia very large gravity anomalies occur and the region is out of isostatic equilibrium despite the fact that tectonic activity ceased 300 ma ago. Here the isostatic response functions points to there being substantial horizontal compression in the crust. Similar conclusions are drawn for the large anomalies in western Australia. The tectonic implications of these anomalies will be examined. In eastern Australia the gravity anomalies are explained in terms of a model of erosion of the highlands and concomitant regional isostatic rebound.

These examples illustrate that gravity over continents can be used as a reconnaissance tool to determine the general stress-state of the interiors of continents, and to permit preliminary evaluations to be made of the principle tectonic features. Detailed gravity measurements over the less-well surveyed continents would determine whether some of the Australian examples are really exceptional or whether they are typical of stable tectonic environments.