On the difference between AHD and orthometric heights

Degree:	Honours or M.Sc (by research)
Keywords:	Physical geodesy, height systems, AHD, orthometric heights, mean gravity inside topographic masses
Entry:	For M.Sc: B.Surv, B.Sc(Catography), preferably 1st class Honours, Postgraduate Diploma
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Project Funding:	Various
Student Funding:	Different scholarships are available from Curtin University of Technology (http://www.scholarships.curtin.edu.au/).
Resources:	Australian gravity and terrain data, software routines to compute the gravitational effect of different shaped bodies (FORTRAN)
Collaboration:	Geoscience Australia

Project Description:

There are many different definitions of height systems, which mainly differ in the way the Earth's gravity field is considered. For example ellipsoidal heights are purely geometrically defined, thus do not account for the gravity field. On the other hand orthometric heights (e.g. Heiskanen and Moritz 1967) can be regarded as a natural definition of heights as they are defined within the Earth's gravity field, as gravity is the cause that drives the flow of water.

Practically defined height systems such as the Australian Height System (AHD) generally do not conform to height systems defined within the Earth's gravity field. The AHD was established in 1971 (Roelse et al. 1971) and the spirit levelling measurements used did not have an orthometric correction applied to account for a change in gravity. Therefore, AHD heights cannot be regarded as orthometric heights. Recent studies show that the difference cannot be neglected (e.g. Friedlieb at al. 1997, Allister and Featherstone 2001).

This project is intended to do a theoretical and practical study of differences between the AHD and a properly defined orthometric height system. Therefore, the definitions of the AHD as well as orthometric height system have to be reviewed and an estimate for the differences (e.g. upper limit) should be given. Furthermore, the spatial distribution of differences should be determined in a suitable area of Australia (e.g. area of highest elevations), by estimating the mean gravity along the plumbline within the topographic masses.

Further Reading :

Allister NA, Featherstone WE (2001): Estimation of Helmert orthometric heights using digital barcode levelling, observed gravity and topographic mass-density data over part of the Darling scarp, Western Australia. Geomatics Research Australasia**,** 25-52.

Friedlieb OJ, Featherstone WE, Denith MC (1997): A WGS84-AHD profile over the Darling Fault, Western Australia. Geomatics Research Australiasia No. 67 December, 1997 pp. 17-32.

Heiskanen, W.A.; Moritz, H. (1967): Physical Geodesy. W.H. Freeman and Company, San Francisco, 364pp.

Roelse, A.; Granger, H.W.; Graham, J.W. (1971): The adjustment of the Australian levelling survey – 1970-71. Technical Report 12, Division of National Mapping, Canberra.