
Digital Zenith Cameras – State-of-the-art astrogeodetic technology for Australian Geodesy

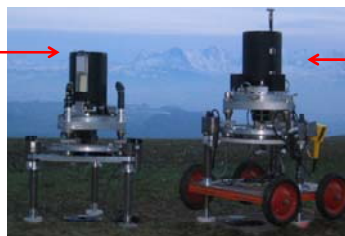
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Developments in Geodetic Astronomy

- Past determination of astrogeodetic vertical deflections
- time-consuming task using conventional instruments
- Progress since ~2000 with the development of two
Digital Zenith Camera Systems (DZCS) in Europe:

DIADEM
(ETH Zurich)



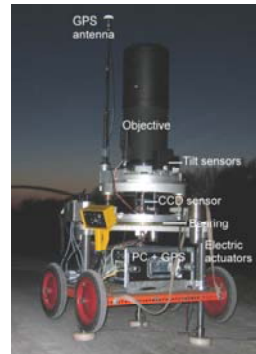
TZK2-D
(Hanover University)

- Key improvement: CCD technology for digital star imaging
→ allows automated star observation

Digital Zenith Camera Systems (DZCS)

- Observation of vertical deflections with DZCS:
 - 20 min per station incl. data processing
 - 0.05"- 0.10" accuracy (e.g., Hirt & Seeber 2008, J. Geod)
- Operational use of European DZCS since 2003:
 - vertical deflections at ~ 900 new stations
 - peak performance of 20 stations per night
- Main application of DZCS vertical deflections:
 - highly accurate quasi/geoid determination
 - mm accuracy at local scales (10..50 km)

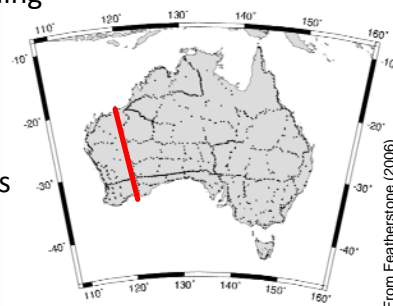
(e.g., Hirt & Flury 2008, J. Geod)



Hanover DZCS in operation

Vertical Deflections over Australia (I)

- Situation to date:
 - only 1080 historic vertical deflections, 1" accuracy
 - very limited use in gravity field modelling
- DZCS could improve the situation
 - E.g., 2000 km DZCS deflection profile
 - 500 stations, 2-3 months observations
 - est. ~ 1-2 dm accuracy for quasigeoid height differences
- Potential applications would include:
 - validation and improvement of
 - * AUSGeoid09 quasigeoid model (Featherstone et al. 2010)
 - * EGM2008, GPS/levelling, Australian Height Datum, ...



Vertical Deflections over Australia (II)

- Local DZCS vertical deflections would be useful:
 - at co-located geodetic sites to precisely connect GNSS, SLR, VLBI



<http://www-ra.phys.utas.edu.au/auscope/>



<http://www-ra.phys.utas.edu.au/auscope/>
Picture Jim Lovell

AUSCOPE- new geodetic infrastructure for Australia

→ As a conclusion, Australia's geodesy would benefit variously from modern DZCS technology

Digital Zenith Cameras for Australia



More details are found in the paper...

Thanks for your attention!

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