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:

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

DIADEM
(ETH Zurich)

TZK2-D
(Hanover University)
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)

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

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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