



The first high-precision digital astrogeodetic traverse in the Southern Hemisphere

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From February 15 to March 01, 2017 we determined vertical deflections along a traverse in Perth, Western Australia, which is the first of its kind in the Southern Hemisphere. The study area is characterized by steep geoid gradients close to the coast of the Indian Ocean. Although the campaign was designed as a low-cost effort, high-precision high-resolution digital astrogeodetic information was collected. The key instrument of the campaign was the digital astrogeodetic zenith camera QDaedalus, which allowed to measure VDs with $\sim 0.2''$ precision, at 39 benchmarks with a ~ 1 km spacing.

The astrogeodetic vertical deflections agree to $0.2\text{--}0.3''$ (north-south) and $0.6\text{--}0.9''$ (east-west) RMS with three independent gravimetric quasigeoid models. After conversion of the vertical deflections to quasigeoid heights an agreement of 20-30 mm (RMS) with these models manifested. Tilt-like biases of ~ 1 mm over ~ 1 km are present for all quasigeoid models within ~ 20 km of the coastline, suggesting inconsistencies in the coastal zone gravity data.

For our measurement campaign, the logistical requirements were comparatively low. The applied equipment can be imported by commercial commuter aircraft and transported in a small vehicle on site, possibly allowing replication in other Southern Hemisphere countries (e.g., Asia, Africa, South America and Antarctica), where VD data are particularly scarce.

We see the project as the beginning of a long-term effort towards a global geodetic vertical deflection data base for gravity field validation. This vertical deflection dataset is freely available via <https://mediatum.ub.tum.de/1399846> to interested researchers. A detailed description about our campaign and the dataset was also published (<https://doi.org/10.1007/s00190-017-1107-x>).