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## Abstract title:

New Astrogeodetic Observations of Vertical Deflections at the Istanbul Astrogeodetic Network Demonstrate Issues in Global Gravity Models along Coastlines

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We present the first astrogeodetic vertical deflections (VDs) observations using the QDaedalus systems in Istanbul. To establish the Istanbul astrogeodetic network, we selected 30 homogeneously distributed existing geodetic benchmarks, often located in coastal and mountainous settings. A total of three measurement campaigns were carried out from February to August 2018 including several repeated observations. The standard deviations for the VDs in Istanbul astrogeodetic network are approximately  $\pm 0.2$  arc-seconds, which is commensurate with earlier studies on the VD accuracy from QDaedalus observations. Importantly, the Istanbul VD observations were controlled via the validation experiments carried out in Germany prior and afterwards.

Our new astrogeodetic VD dataset was compared with modelled VDs from the GGMplus gravity functional maps. The VD differences tend to increase towards the coastlines where spurious discrepancies between 2 and 6 arc-seconds amplitude were encountered at 14 stations. We interpret these as weaknesses in the modelled VDs along the Istanbul coastlines, most likely reflecting increased errors in the marine gravity field the GGMplus model depends on (via EGM2008). Our study demonstrates the value of astrogeodetic VDs to benchmark the varying GGM quality along rugged land-sea transitions, where land and marine data sets may be in larger disagreement. The new VD data set is expected to be of value to assess the quality of future GGMs such as EGM2020. The data will also contribute to the determination of a highly accurate local geoid model for the Istanbul metropolitan area.