

The Latest Gravimetric and Hybrid Geoid Models of Taiwan

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We present the 2025 gravimetric and hybrid geoid models of Taiwan, covering the main island, offshore islands, and surrounding seas. The gravimetric model combines terrestrial, shipborne, and airborne gravity with altimetry derived marine gravity anomalies, offshore island observations, a global gravity field model (EGM 08), and terrain data (20-m DEM). A hybrid model is then formed by fitting a correction surface to quality checked GNSS/leveling observations (the original number of points is 2,159), linking the gravimetric model to the current Taiwan Vertical Datum 2001 (TWVD2001). The gravimetric model provides a continuous representation of regional geoid undulations over Taiwan and its offshore islands. At independent GNSS/leveling validation points, however, its mean difference from observed geoid undulations is -0.222 m, with a standard deviation of 0.079 m. The hybrid correction reduces these values to 0.003 m and 0.041 m, respectively. Evaluation against the full GNSS/leveling dataset gives the hybrid model a mean difference of 0.001 m and a root mean square difference of 0.024 m; this full dataset includes points used to construct the correction surface and therefore does not represent independent accuracy. These results show the value of maintaining both models: the gravimetric geoid provides a physically based surface across land and sea, while the hybrid model supports ellipsoidal to orthometric height conversion consistent with TWVD2001. Further improvements will depend on gravity coverage in mountains and coastal waters, as well as consistent reference frames and observation epochs for GNSS/leveling data.