



Multi-altitude airborne gravity for geoid determination: unification of height systems between Taiwan and its offshore islands

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Several airborne gravity surveys were and are being carried out in Taiwan at 5000 and 1500 m flight altitudes. Together with land and shipborne gravity data, such airborne gravity contributes significantly to geoid modeling around Taiwan, where the terrain changes from 4000 m at Mt. Jade to -6000 m at a deep trench east of Taiwan. Airborne gravity data at flight altitudes are downward continued to sea level using a FFT and least-squared collocation-based technique. The use of terrain and bathymetry improves the accuracy of downward continuation over land; at sea the accuracy improvement is marginal. A geoid model is determined using all available surface and airborne gravity data, and is assessed using geoidal undulations at island-wide first-order benchmarks. The differences between the gravimetric and GPS-derived geoidal undulations range from few cm to more than dm, depending on the terrain and the gravity data density. With this geoid model, the vertical datum differences between Taiwan and its offshore islands are determined. The datum differences range from 15 cm (islands over the South China Sea) to 76 cm (islands over the Kuroshio Current east of Taiwan in the Pacific).