



## **Spectral combination of land-based, airborne, shipborne and altimeter-derived gravity values: examples in Taiwan and Tahiti**

Cheinway Hwang

National Chiao Tung University, Civil Engineering, Hsinchu, Taiwan (cheinway@mail.nctu.edu.tw)

Taiwan and Tahiti are bordered by seas and are islands with mountain ranges up to 4000 m height. The gravity fields here are rough due to the geodynamic processes that create the islands. On and around the two islands, gravity data have been collected by land gravimeters in relative gravity networks (point-wise), by airborne and shipborne (along-track) methods and by transformations from sea surface heights (altimeter-derived). Typically, network-adjusted land gravity values have accuracies of few tens of micro gals and contain the full gravity spectrum. Airborne gravity values are obtained by filtering original one-HZ along-track gravity values collected at varying flight altitudes that are affected by aircraft dynamics, GPS positioning error and gravimeter error. At a 5000-m flight height, along-track airborne gravity has a typical spatial resolution of 4 km and an accuracy of few mgal. Shipborne gravity is similar to airborne gravity, but with higher spatial resolutions because of ship's lower speed. Altimeter-derived gravity has varying spatial resolutions and accuracies, depending on altimeter data, processing method and extent of waveform interference. Using the latest versions of Geosat/GM, ERS-1/GM, ENVISAT, Jason-1/GM, Cryosat-2 and SARAL altimeter data, one can achieve accuracies at few mgal. The synergy of the four kinds of gravity datasets is made by the band-limited least-squares collocation, which best integrates datasets of different accuracies and spatial resolutions. The method uses the best contributions from a DEM, a global gravity model, available gravity datasets to form an optimal gravity grid. We experiment with different optimal spherical harmonic degrees of EGM08 for use around the two islands. For Tahiti, the optimal degree is 1500. New high-resolution gravity and geoid grids are constructed for the two islands and can be used in future geophysical and geodetic studies.