



# A new integrated software for monitoring and testing BGM-3 gravimeters

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This work was supported through funding from NSF award OCE-1061865

An NSF funded effort is currently underway at Potential Fields Pool Equipment (PFPE) to develop a next generation gravity software. This software aims to provide a user-friendly and semi-automated tool for monitoring the BGM-3 gravimeter and performing essential instrument tests such as ship-to-shore gravity ties and in-port tests (zero damp and tilt test). The program suggests corrective actions to keep the system in specification and generates consolidated meta-data (e.g., bias) for use in post-processing and to provide to the Rolling Deck to Repository (R2R). This software will help provide a UNOLS-wide tool for doing these procedures and help establish best practices. This program would replace the testlog program developed at LDEO in the 1990s and used by PFPE, NAVO, and others over the past 20 years. Achieving the above stated primary goal required implementing filters for reducing the gravity data and a graphical display for showing the filtered gravity measurements in real-time. Having implemented these capabilities, it will be easy to extend this code to provide an almost real-time (delayed by half the length of the Gaussian Filter) display of the free-water anomaly and allow comparisons to ships bathymetry. Such a program would allow both technicians and scientists to easily monitor the gravimeter status and data. This effort does not seek to (1) replace gravimeter data loggers already used on ships, or (2) provide reduced data for scientific use, or (3) provide quality assurance of the exhaustive data. To achieve the software goals, two programs have been developed: gravlog and gravGui. Gravlog is a C/C++ program that provides low level data management and filtering functions and executes most of the math. It runs as a daemon (i.e., in the background) on a computer directly connected to the gravimeter's data buffer via a serial connection. Filter parameters can be changed by the user in the GUI program described below and the changes made without rebuffering the data. Gravlog was originally developed in May 2010 for use on PFPE pool gravimeters and has been used on four deployments to date. The most recent upgrades were completed in February 2012 and its functionality validated against the testlog software during the recent BGM-3 deployment on the R/V Kilo Moana and in October 2012 on the R/V Langseth. When run with the same filter type and length, the filtered gravity computed by gravlog and testlog agreed to within 0.01mGal, the accuracy of testlog. Additional work for doing real-time, underway reduction is on-going and includes: real time Eotvos and latitude corrections, real time filtering of ship speed, ship heading, and depth under keel. GravGui is a graphical user interface (GUI) client which displays real time data and gravimeter health status, supports common instrument tests (e.g., ship-to-shore ties and in-port tests), and allows the user to interface with gravlog. The program is coded in Qt, can run in Linux, Windows, or Mac, and is connected to Gravlog via network UDP. This program does not necessarily have to be installed in the gravimeter room and can therefore be displayed on a computer elsewhere on the ship. Functionality includes: real time visual indications of gravimeter health and gravity data quality, semi-automated dockside gravity tie interface, semi-automated in-port tests (zero damp and tilt), quality assurance of test-generated metadata (bias, etc.), automatic report generation

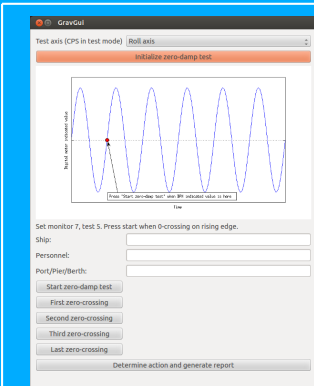


Figure 5: zero damp test interface



Figure 1: main window



Figure 6: R/V Knorr self-contained S/W installation

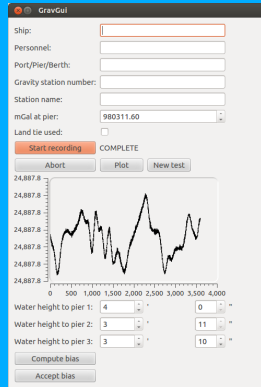


Figure 2: gravity tie interface

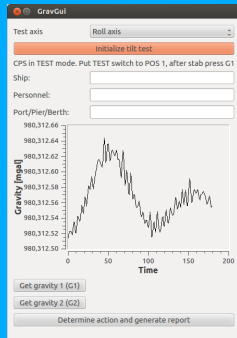


Figure 3: tilt test interface

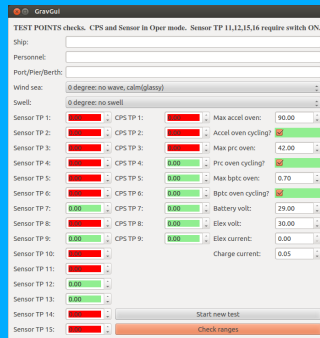


Figure 4: Test points interface. Red and green colors indicate health of the gravimeter based on user input

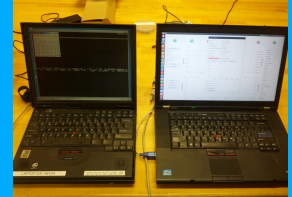


Figure 7: Validation of new software vs testlog on R/V Langseth

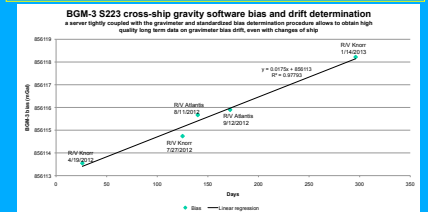


Figure 8: bias history generated by new software