

Absolute gravity measurements at the Conrad Observatory by the University of Luxembourg

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Absolute gravity measurements have been performed twice at the Conrad Observatory by a team from the University of Luxembourg. The two main objectives are the calibration of the superconducting gravimeter and the determination of its instrumental drift. This project is a long-term collaboration with the colleagues from the BEV and the University of Vienna who conduct absolute and superconducting gravity observations at the Conrad Observatory.

Episodic absolute gravity measurements are carried out at the Conrad Observatory by the team of the Geophysics Laboratory of Luxembourg. The last-born generation of the FG5 absolute gravimeter (manufacturer Micro-g LaCoste Inc., USA) is used to determine the absolute values of the gravity acceleration, g . This is a transportable instrument (Fig. 1) measuring the free fall acceleration of a mass in a vacuum cylinder. The positions of the mass during the free fall are measured with an interferometer using an Iodine stabilized laser. A rubidium clock steered by GPS provides the accurate timing. The accuracy is approximately $2 \cdot 10^{-9}$ of g .



Figure 1: Absolute gravimeters side-by-side with the superconducting gravimeter at the Conrad Observatory (FG5-242 from Austria, FG5X-216 from Luxembourg with the glass tube and SG GWR C025).

The absolute gravity measurements (Fig. 2) are used to determinate the scale or calibration factor of the relative superconducting gravimeter GWR C025 operating

continuously at the Conrad Observatory. They also allow us to estimate the instrumental drift of the SG.

The calibration of the SG requires taking measurements for 3 to 4 consecutive days, preferably when the gravity variations are the largest (i.e. during a maximum of the Earth tides).

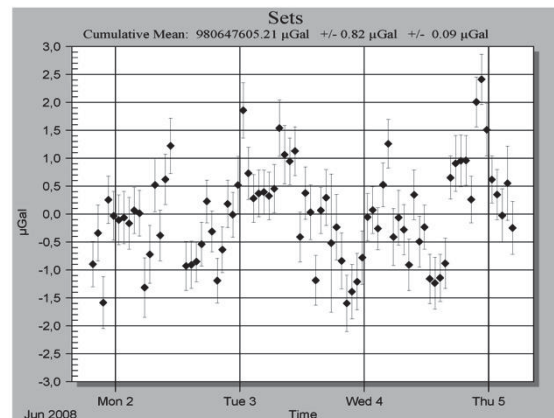


Figure 2. Results of the absolute measurements from the 1st to the 5th of June 2008 corrected for Earth tides, atmospheric pressure and polar motion effects.

The Luxembourg absolute gravimeter already visited two times the Conrad Observatory in June 2008 and 2012. During the measurements, our colleagues from the Federal Office of Metrology and Surveying (BEV) take advantage of the opportunity to measure with their own absolute gravimeter to check that both absolute meters are operating properly.

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