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# Relative gravimeter calibration system for high accurate applications

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Highest accuracy for the calibration of relative gravimeters might be demanded to achieve advanced objectives of state-geodetic and geo-scientific surveys. To reveal local gravity variations in geodynamic active areas or to integrate absolute gravity observations in national reference networks, a scale inaccuracy for relative gravimeters of $1{\cdot}10^{-4}$ is striven for. If the scale factor und its inaccuracy is well known, misinterpretation of apparent variations due to uncertain calibration of the relative meters can be avoided. Applications to detect local vertical movements of the Earth's surface or local mass shifts in the underground are focusing on the microgal accuracy level or even better.

Recently, the Gravity Meter Calibration System Hannover has been improved with respect to its most important parts: the Harz calibration line and the vertical calibration line in Hannover (20-storey building). For this Upgrade 2017, only "state-of-the-art" measurements with gravimeters from Scintrex (Canada) and ZLS Corporation (USA) have been used. For the two calibration lines, the Upgrade 2017 replaces the solution from 2004 which was based on measurements with LaCoste-Romberg instruments only. They were the measuring standard in the $70^{th}$ and $80^{th}$. For scale determination of the Harz reference line, the older absolute gravity observations with JILAg-3 from 1986 and 1987 have been completed with modern A10 measurements in 2013. In the Vertical Gravimeter Calibration Line Hannover (VGCH), the base connection 210-370 (1st to 17th floor) has been obtained with a standard deviation of 11 nm/s$^2$. The inaccuracy between adjacent floors varies between 5 and 10 nm/s$^2$ for the points below the $18^{th}$ floor. The scale inaccuracy of the Harz calibration line as well as of the VGCH is estimated to be $2{\cdot}10^{-4}$ (expanded uncertainty, confidence interval 95%). A regular checking of the relative gravimeters with regard to instrumental air pressure effects and instrumentally caused scale instabilities is strongly recommended.