First experiences with an absolute quantum gravimeter during field campaigns

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Recent technological advances in the field of quantum gravimetry led to the first commercially available absolute quantum gravimeters (AQG) that are designed for deployment in field surveys (AQG by Muquans, B series). Limitations of other relative or absolute gravimeters currently used for environmental applications which require highly accurate and precise data (e.g. monitoring subsurface water storage changes), are expected to be at least partly overcome with AQGs.

In this contribution, we report on the first experiences gained with the Muquans AQG-B02 during a gravimetric field survey in the vicinity of the Geodetic Observatory Wettzell (Bavarian Forest, Germany). The instrument is part of MOSES, a novel observing system of the German Helmholtz Association, comprising flexible and mobile observation modules for event-based investigation of hydrological extreme events, among other processes. To our knowledge, this is the first use of an AQG in an outdoor field campaign. During the 4-day survey, measurements with the AQG were performed on small concrete pillars at 4 field locations and partly repeated on consecutive days. In between the field measurements, reference measurements were carried out on a laboratory pillar of the Geodetic Observatory. We present the AQG field deployment with regard to transport, site design and power supply. The AQG survey is evaluated with respect to its technical and operational feasibility and the data are assessed in terms of their sensitivity, accuracy and reproducibility. Parallel recordings of environmental conditions such as wind speed and air temperature allow for assessing their potential disturbing effect on the gravity measurements. Observations with an A10 absolute gravimeter on the same sites few days before or after the AQG measurements were used for comparing the absolute gravity values.