

First experiences with an absolute quantum gravimeter during field campaigns

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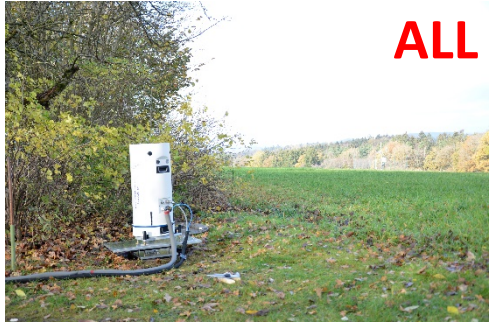
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Gravimetric field survey with an Absolute Quantum Gravimeter

Instrument: Muquans AQG#B02

Study area: Gravimetric footprint network of the Geodetic Observatory Wettzell, Germany

Sites: 4 field sites
(forest/grassland),
1 observatory site



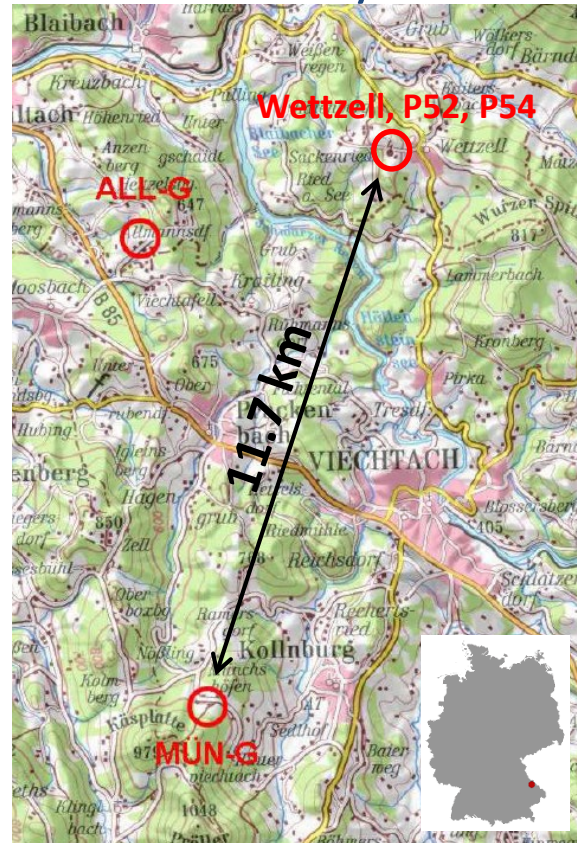
ALL

564 m amsl,
gravity difference to
Wettzell $\Delta g_w = +5.13$ mGal



MUN

807 m amsl,
 $\Delta g_w = -48.03$ mGal

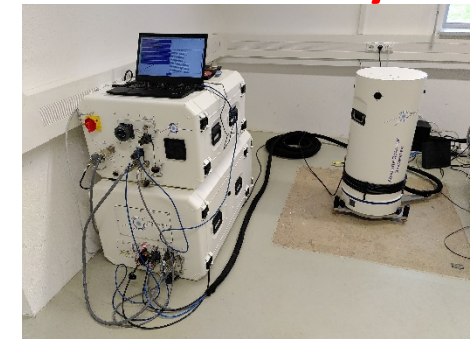


P52



643 m amsl,
 $\Delta g_w = -7.56$ mGal

**Wettzell
observatory**



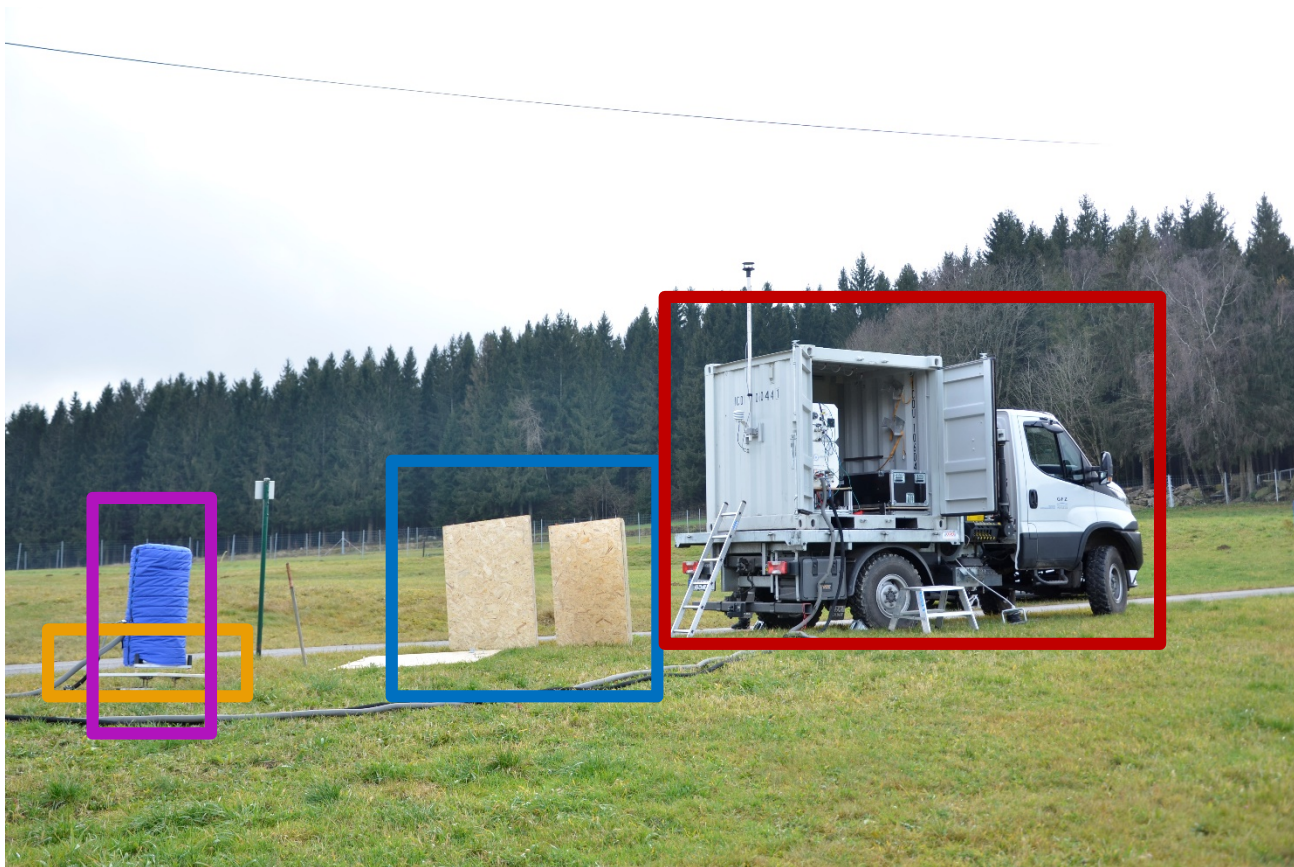
607 m amsl
 $g = 980837.1$ mGal

P54



623 m amsl,
 $\Delta g_w = -4.59$ mGal

AQG field survey – Technical setup



Assemble & disassemble time at each measurement site: approx. 30 min

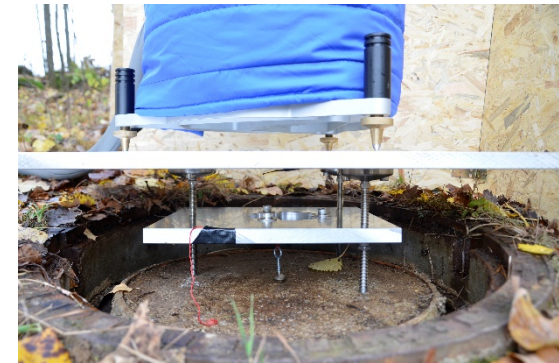
temperature
sensor head



transport and
power supply



wind protection



pillar/ stability

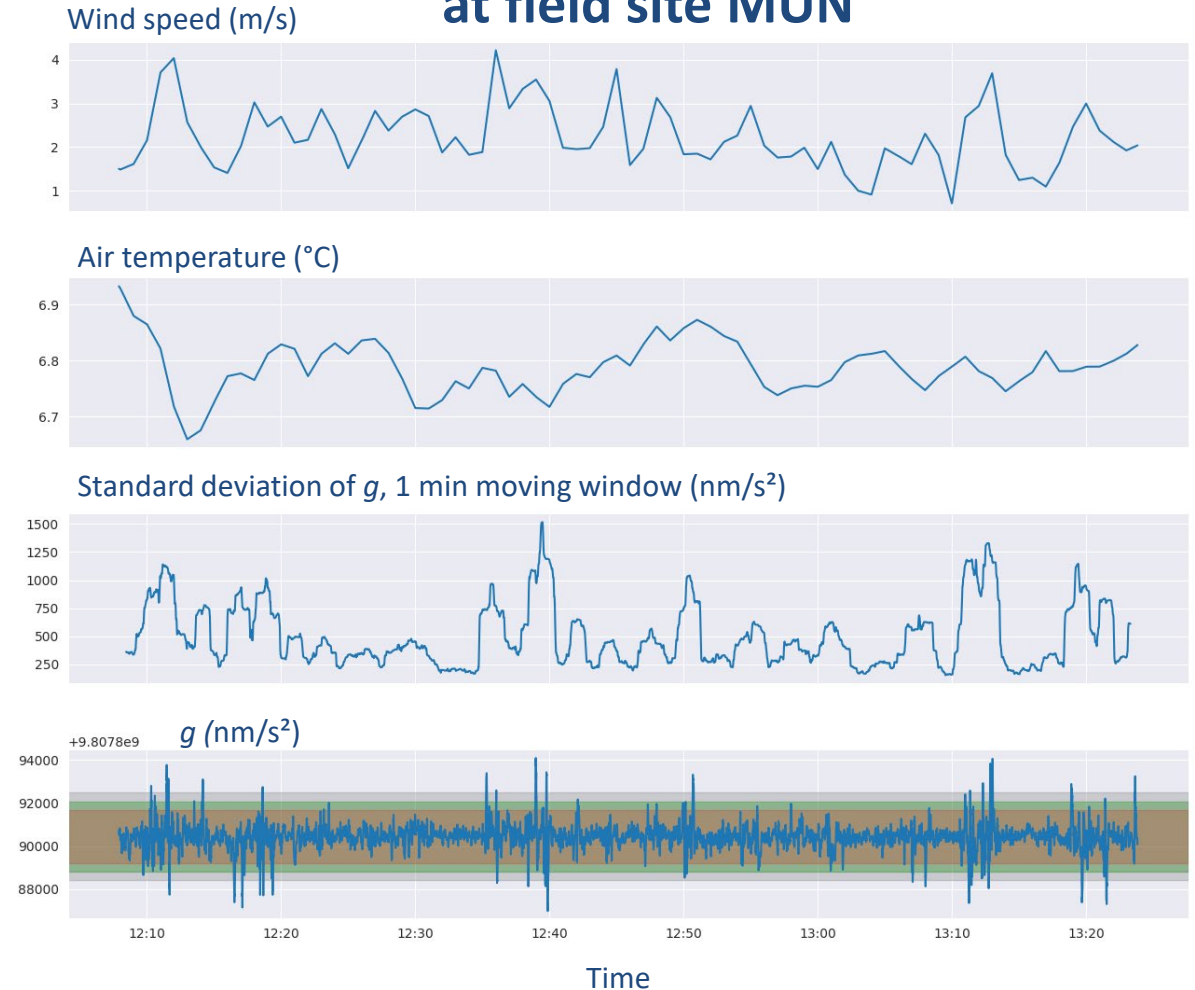
AQG field survey results – Sensitivity and precision

A total of 15 measurements have been performed at the different sites within a 4-day survey period, with a duration of at least about 60 minutes for each measurement.

Statistics of absolute gravity g after 60 min
(as mean of all 15 measurements):

- Standard deviation of raw data (individual drops of about 2 Hz): **273 nm/s²**
- Standard error of mean: **11 nm/s²**
- Slight dependence of precision on wind speed (turbulence causes movements of truck with AQG laser unit and of laser fibres), see example for MUN

Example of AQG measurements at field site MUN



AQG field survey results – repeatability and accuracy

Repeated measurements at some of the sites were done, mostly with de-mounting and transport of the instrument inbetween.

Number of measurements:

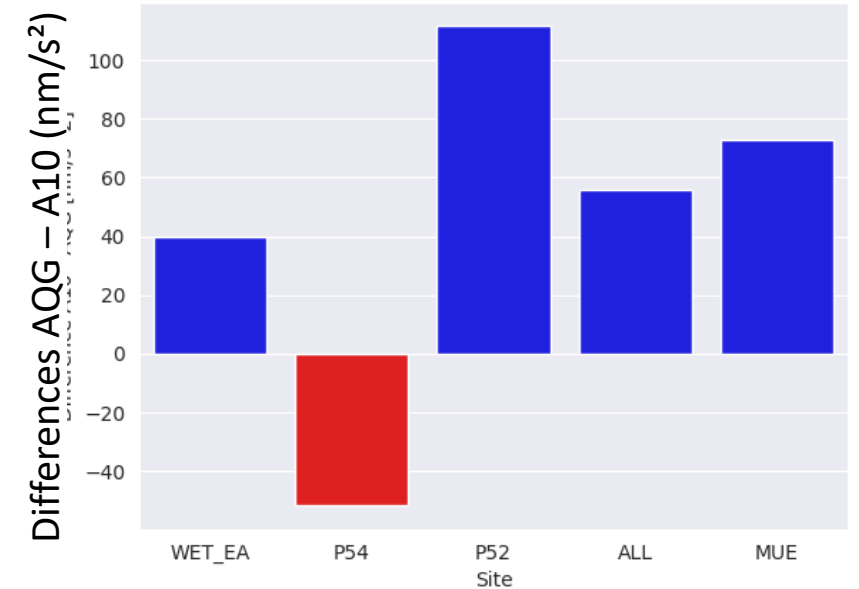
- 6 at Wettzell
- 3 at ALL
- 3 at P54
- 2 at P52

The average repeatability was $41 \pm 35 \text{ nm/s}^2$

On all sites, g was also measured with A10#012 a few days before the AQG campaign and used as reference. A10#012 is tied to the absolute gravity reference established at Wettzell.



A10#012 measurement at P54



From differences to A10#012, the mean accuracy of the AQG#B02 is $46 \pm 70 \text{ nm/s}^2$ for the 5 sites.