# Detection and investigation of magnetic low-frequency noise near urban area

Niko Kompein, Rachel Bailey, Ramon Egli

**Recent investigations in the course of the ZAMG City-Noise Project revealed a magnetic, low frequency noise content preceding the set in of high frequency noise early in the morning at the Cobenzl Observatory, Vienna. Investigations on this subject may lead to a temporal correlation regarding an undiscovered kind of artificial or natural source. A mobile 3-component sensor was used to gather magnetic field data at selected sites in Austria for further comparison. The Conrad Observatory, built into a tunnel in Trafelberg, Lower Austria, is secluded and hardly disturbed by urban influences, hence the magnetic records may be used as "undisturbed reference signals".**

The first part of this project was to gather data with a 3-C fluxgate magnetometer at the reference sites of the Cobenzl and Conrad Observatories. The 3-C fluxgate data had to be resampled and temporally shifted for best fit of the observatory reference data. Furthermore, the calibration factors had to be determined regarding the two observatories.

Resampling was done using a Gaussian-weighted average, and the temporal shifting by calculating a Gaussian-weighted correlation coefficient. The calibration factors were determined by plotting the 3-C fluxgate data against the observatory reference data. The calibration factor of the 3-C fluxgate in regard to the observatory data is the first order term of the linear interpolation.

A long data series has been collected at the Cobenzl observatory as well as the first datasets from the Conrad observatory. These were used to get calibration factors.

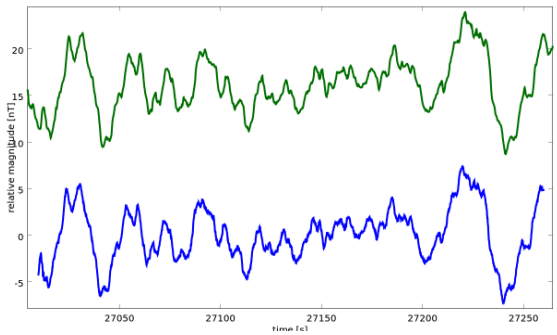


Figure 1: Magnitudes of relative total field change compared : 3-C fluxgate measurement (blue) at Cobenzl Observatory „Absolut-Haus" pedestal compared to lemi-025 data of Cobenzl observatory (green) [nT] - both versus time in seconds (around 20 m distance between the two locations).

Figure 1 shows the comparison of the magnitude of the relative field change measured by the mobile 3-C fluxgate magnetometer to the Cobenzl Observatory data versus time in seconds. Although not visible lemi-025 data (green) is more smoother than the 3-C fluxgate data (blue).

In Figure 2 the magnitude of the relative total field change of the 3-C fluxgate (blue) is plotted versus the the above mentioned data in Figure 1 of lemi-025 (green). Hence the first-order term of the linear regression model is the calibration factor, which is around 0.97.

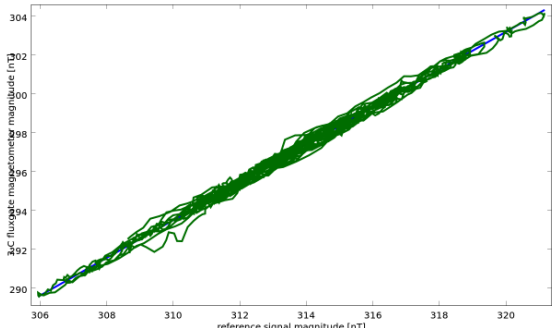


Figure 2: Linear regression model (blue) for above mentioned magnitude of relative total field change of 3-C fluxgate data with regards to Cobenzl observatory lemi-025 data (green) => calibration factor = 0.97.

A further objective in this project includes tests of system dependent noise behaviour of the 3-C fluxgate sensor while sampling at different sampling rates.

**Author:**
N. Kompein[1], R. Bailey[1], R. Egli[1]
1) Central Institute for Meteorology and Geodynamics, Vienna, Austria

**Corresponding author:**
Niko Kompein
Central Institute for Meteorology and Geodynamics
Hohe Warte 38, 1190 Vienna, Austria
Tel.: +43 (1) 36026 2510
e-mail: niko.kompein@gmx.at