EGU23-11059

Determination of the frequency response of seismic and infrasonic IMS station sensors using a traceable on-site calibration approach

Michaela Schwardt[1], Christoph Pilger[1], Samuel Kristoffersen[2], Franck Larsonnier[2], Paul Vincent[2], Leonard Klaus[3], Thomas Bruns[3], Lars Ceranna[1]

[1] *Federal Institute for Geosciences and Natural Resources (BGR), Germany*

[2] *Commissariat à l'Energie Atomique et aux Energies Alternatives (CEA), France*

[3] *Physikalisch-Technische Bundesanstalt (PTB), Germany*

Contact: michaela.schwardt@bgr.de

Bundesanstalt für Geowissenschaften und Rohstoffe

Background

Newly developed laboratory calibration methods (primary and secondary) & equipment in the low frequency range down to 0.01 Hz for seismometers & microbarometers provide the possibility of metrological traceability for on field sensors. This new unbroken chain of calibrations from laboratory to on-site, ensures that measurement results delivered by on field sensors are traceable to SI units, allows to determine accurate amplitudes & phases with assigned uncertainties, thereby improving data quality & sensor reliability. We performed on-site calibration tests with both laboratory calibrated seismometers & microbarometers using signals from different natural & anthropogenic excitation sources.

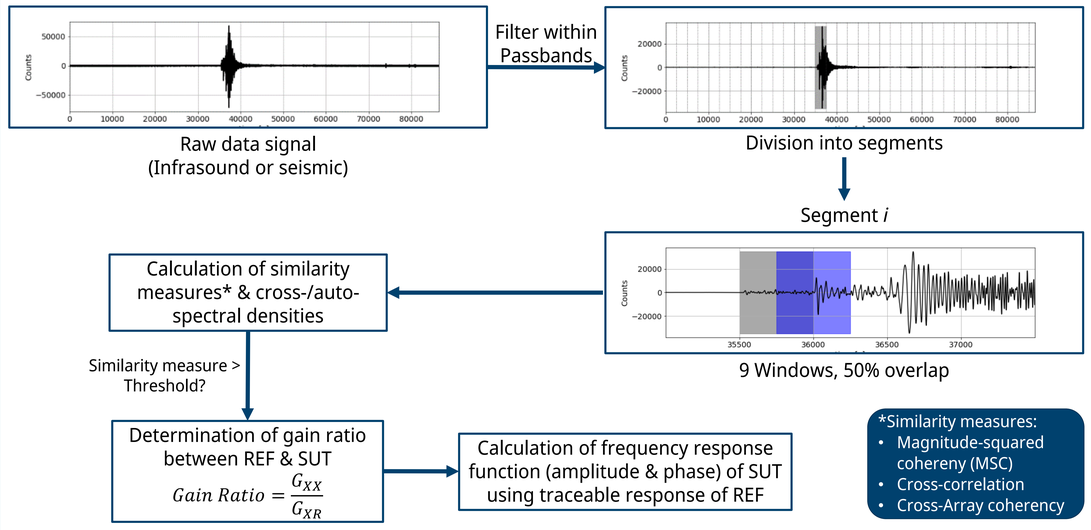
On-Site Calibration Procedure for Seismic & Infrasonic Sensors

Requirements

1) Co-location of reference (REF) & operational station sensors under test (SUT)
2) Response function of reference sensor is precisely determined & traceable to SI units
3) sufficient coherent excitation signals within the relevant frequency range

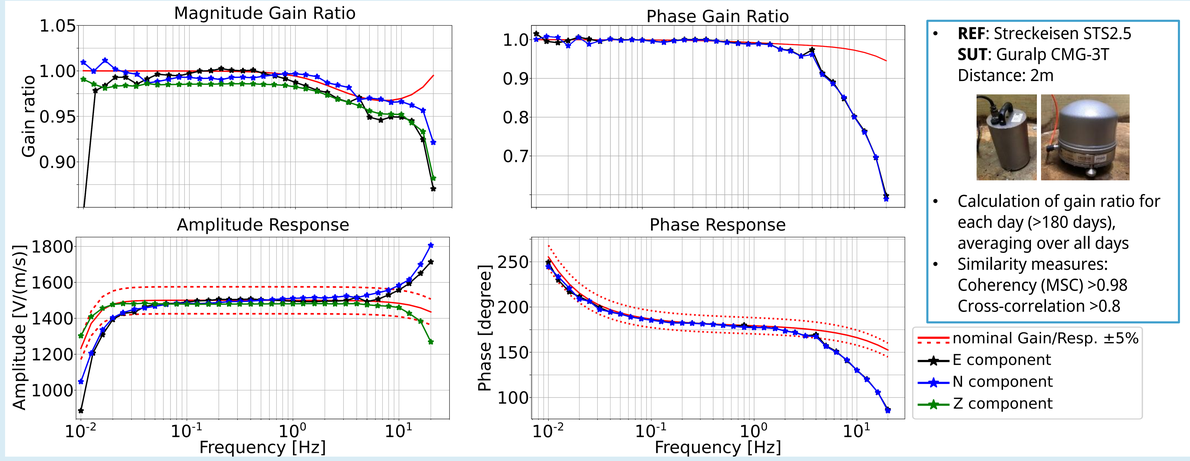
Procedure

Calculation of the gain ratio between SUT & REF following a modified approach of Gabrielson (2011)

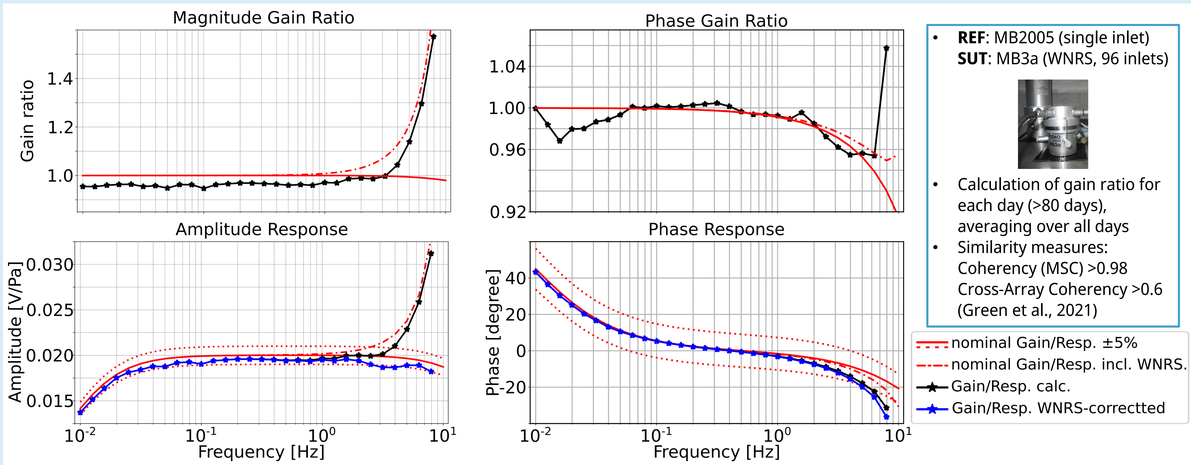


On-Site Calibration Results

Seismic



Infrasound



The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States

References

Gabrielson, T. B. (2011). In situ calibration of atmospheric-infrasound sensors including the effects of wind-noise-reduction pipe systems. The Journal of the Acoustical Society of America, 130(3), 1154-1163.

Green, D. N., Nippress, A., Bowers, D., & Selby, N. D. (2021). Identifying suitable time periods for infrasound measurement system response estimation using across-array coherence. Geophysical Journal International, 226(2), 1159-1173.