Project 101072599 — HORIZON-MSCA-2021-DN-01

Views and opinions expressed are however those of the author only and do not necessarily reflect those of the European Union or EUROPEAN RESEARCH EXECUTIVE AGENCY. Neither the European Union nor the granting authority can be held responsible for them.
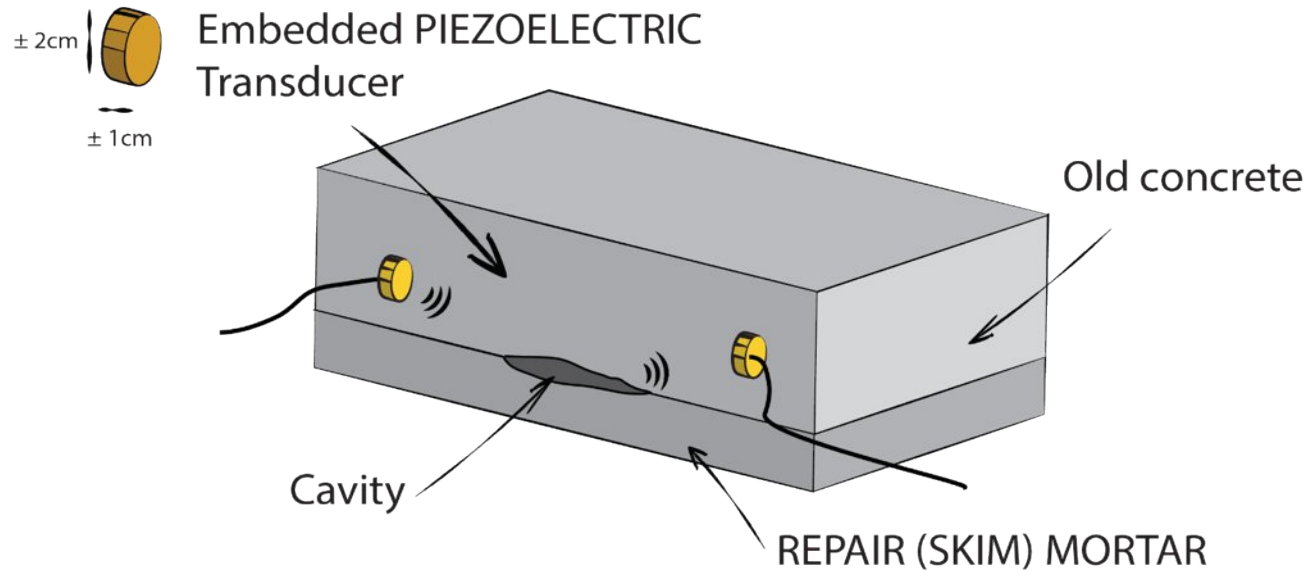
Funded by the European Union

Filtering of environmental effects for ultrasonic based monitoring using embedded piezoelectric transducers

Jitendra, Sharma
Université libre de Bruxelles (ULB)
DC08

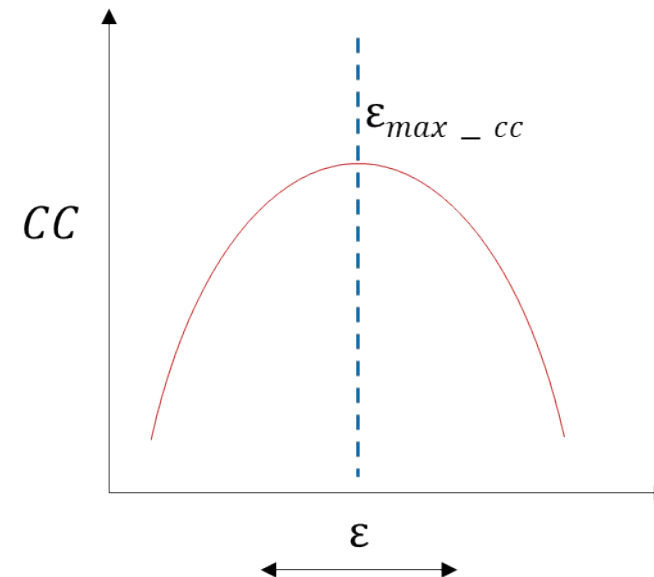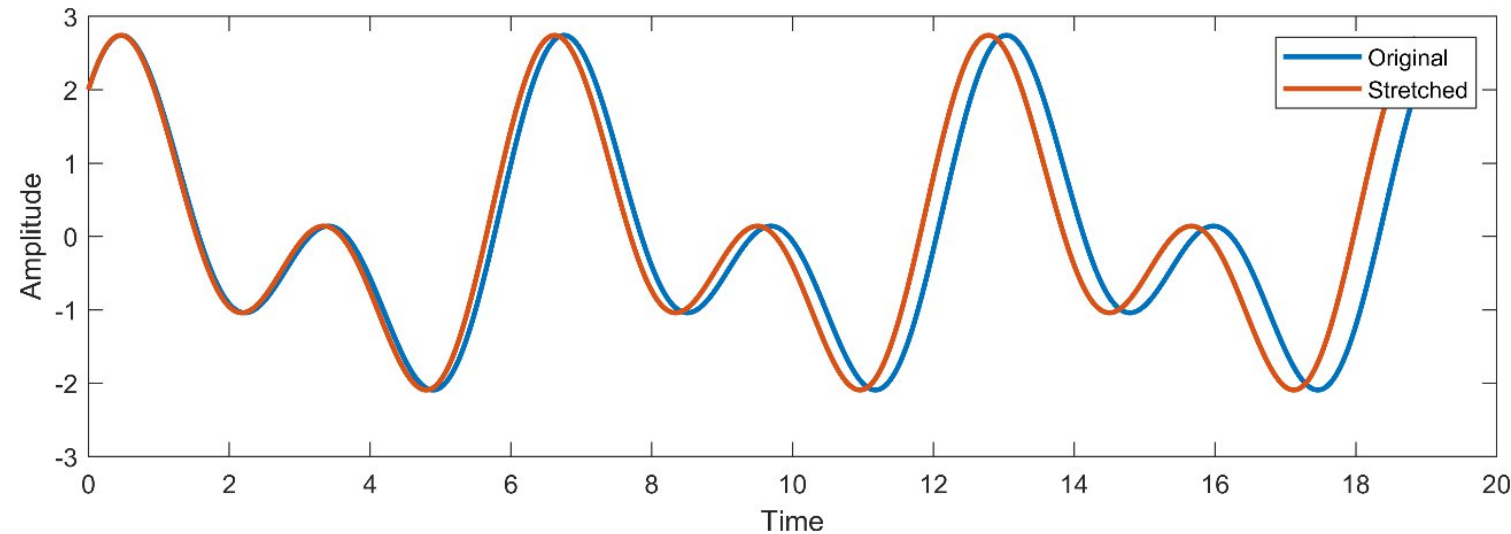# Monitoring of repaired zones

Monitoring of repaired zones

- Time stretching technique

$$t\prime = t(1 + \varepsilon)$$

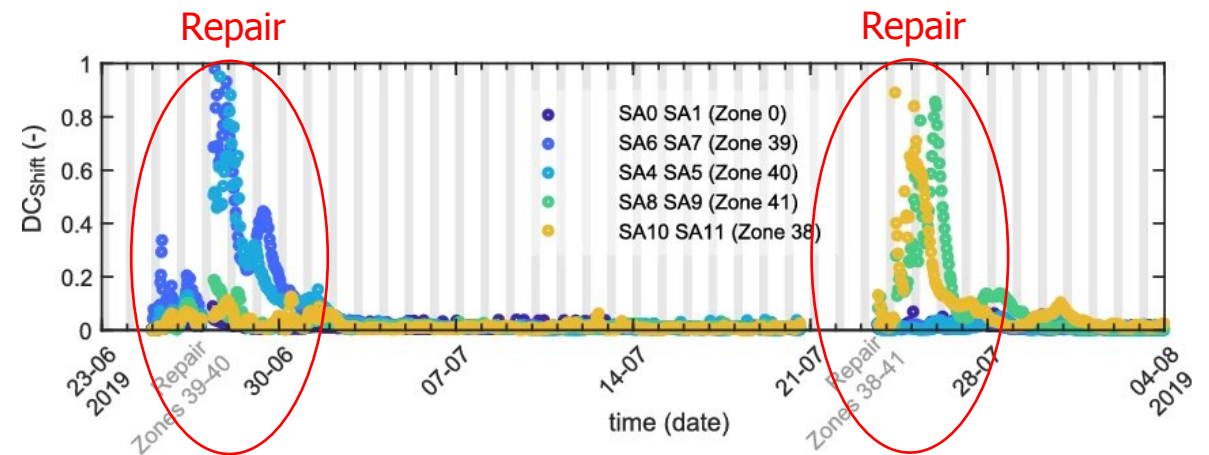$$\varepsilon = \frac{dt}{t} = -\frac{dV}{V}$$

- The global relative velocity changes (ε) estimated by

$$CC\,(\varepsilon) = \frac{\int_{t_0}^{t_f} S(t)\, S_0\big(t(1+\varepsilon)\big)\, dt}{\sqrt{\int_{t_0}^{t_f} S^2(t)\, dt \ \int_{t_0}^{t_f} S_0^2\big(t(1+\varepsilon)\big)\, dt}}$$
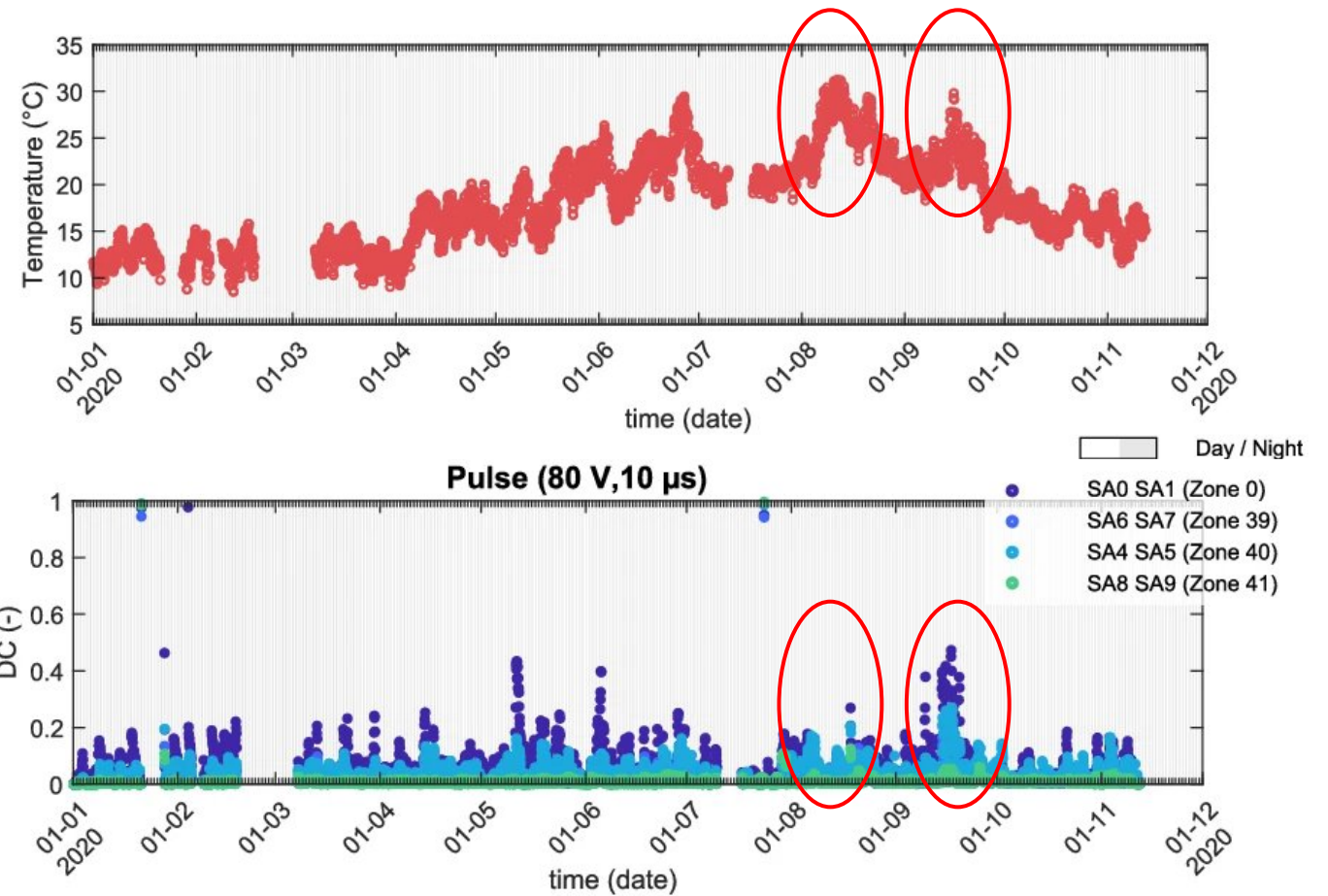
Monitoring of repaired zones (in Rogier) – short term

- DC = 1 - CC

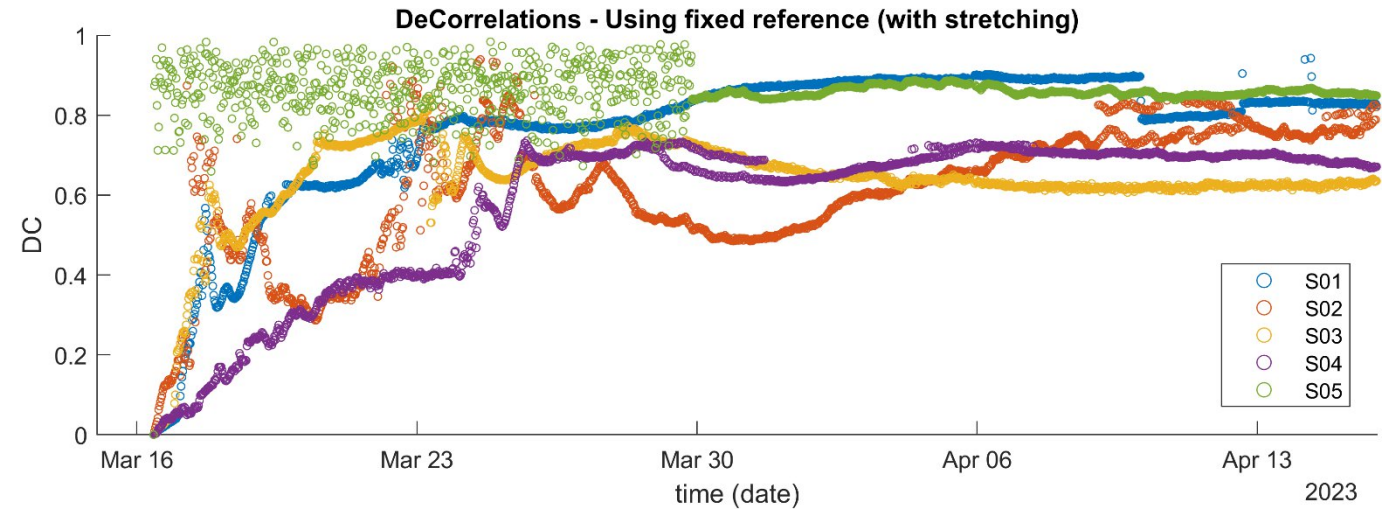- Shifted reference : 48h average of stretched signals
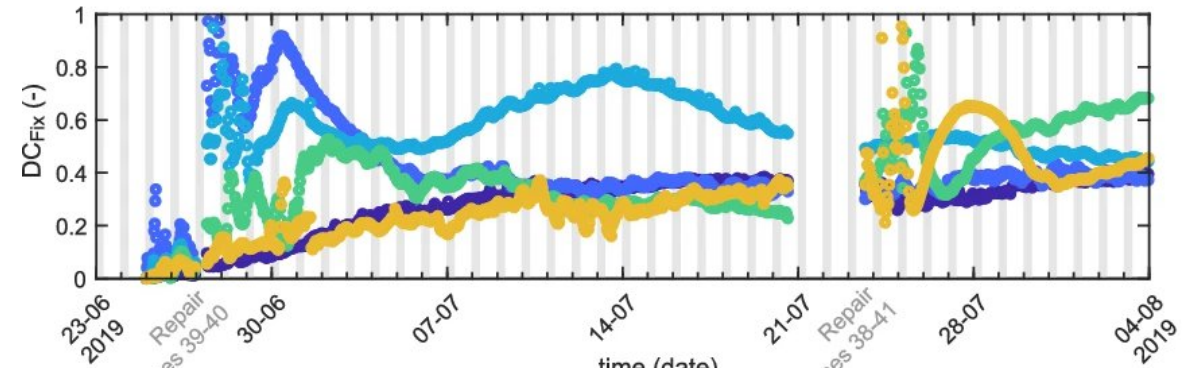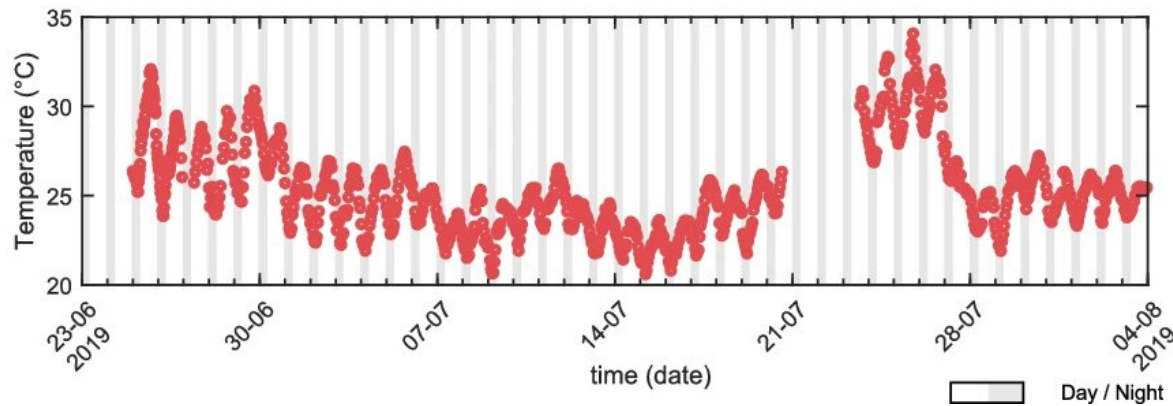
Monitoring of repaired zones (in Rogier) – long term

- Still variations in DCs due to Temperature.
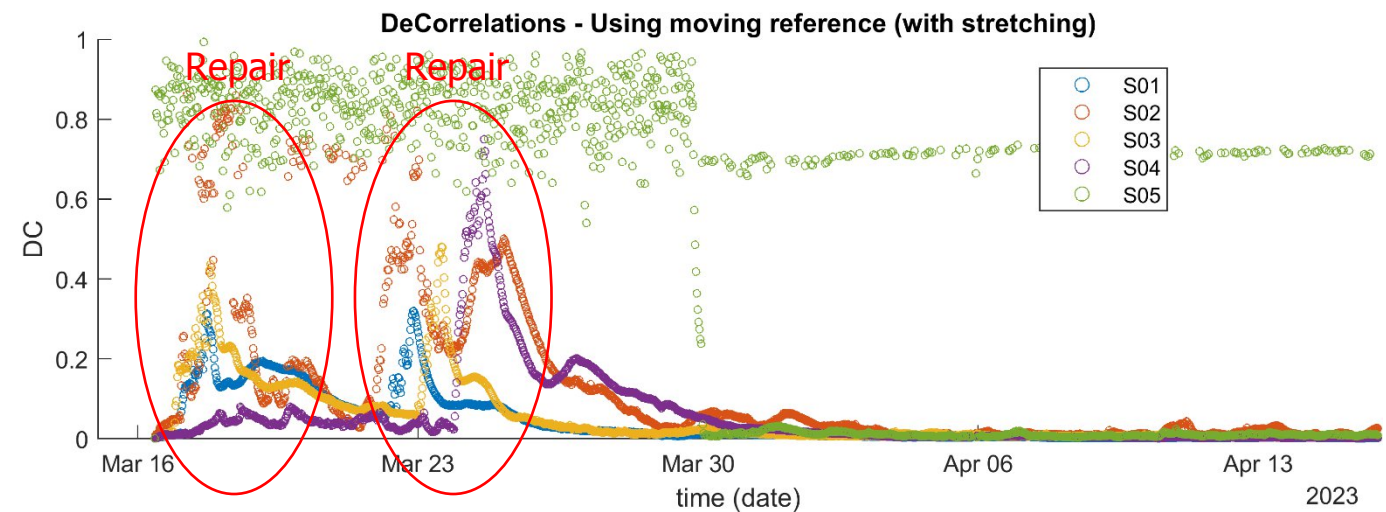
- Reference : 48h average of stretched signals

Monitoring of repaired zones (in Woluwe) – short term

- System install on 15-Mar-2023
- DC = 1 - CC

- Moving reference : 48h average of stretched signals
- S05 : No repaired zone

DeCorrelations - Using fixed reference (with stretching)

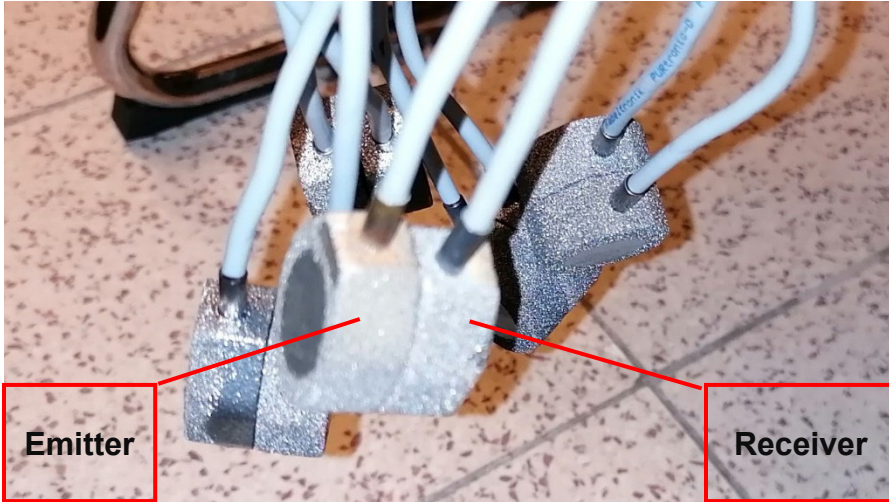DeCorrelations - Using moving reference (with stretching)
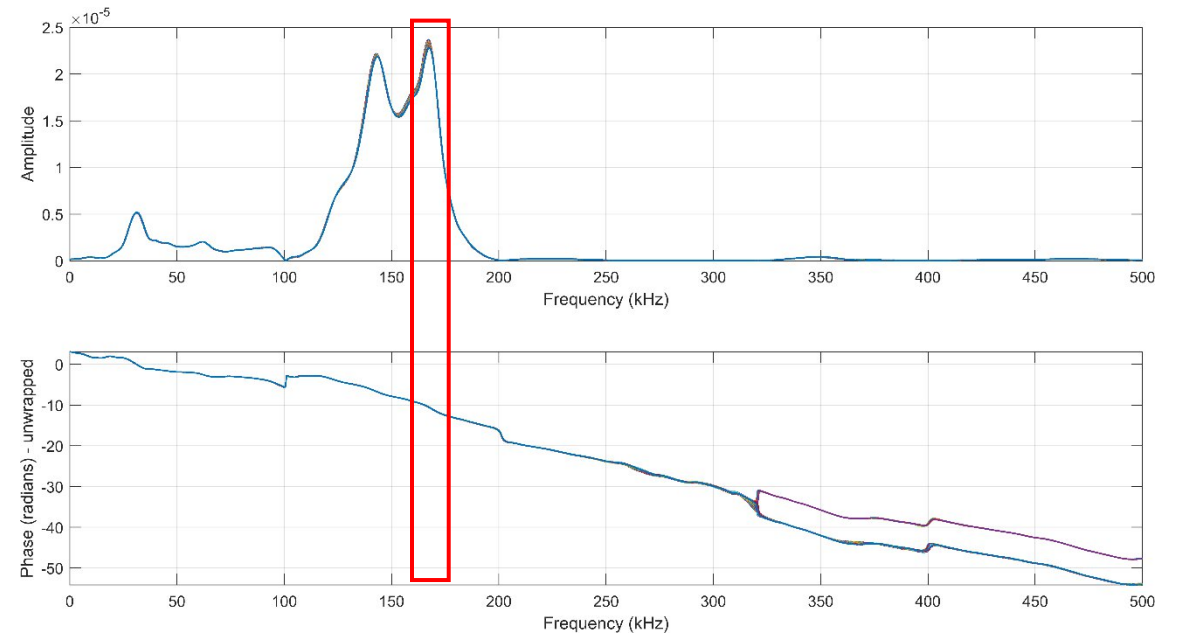
Monitoring of repaired zones (in Woluwe) – long term

- S05 : No repaired zone

- Got same effect as in Rogier tunnel

- Reference : 48h average of stretched signals

Temperature Variations

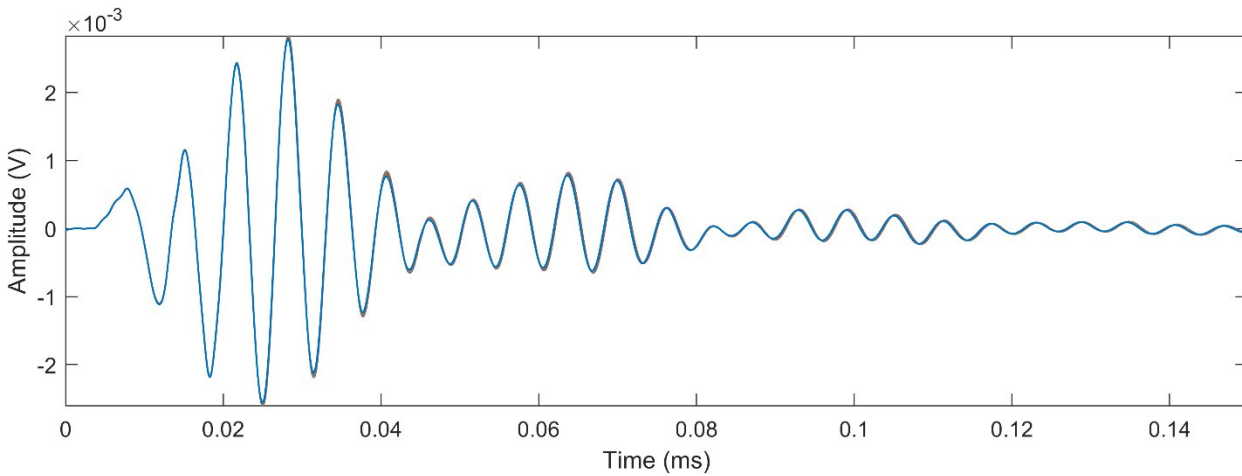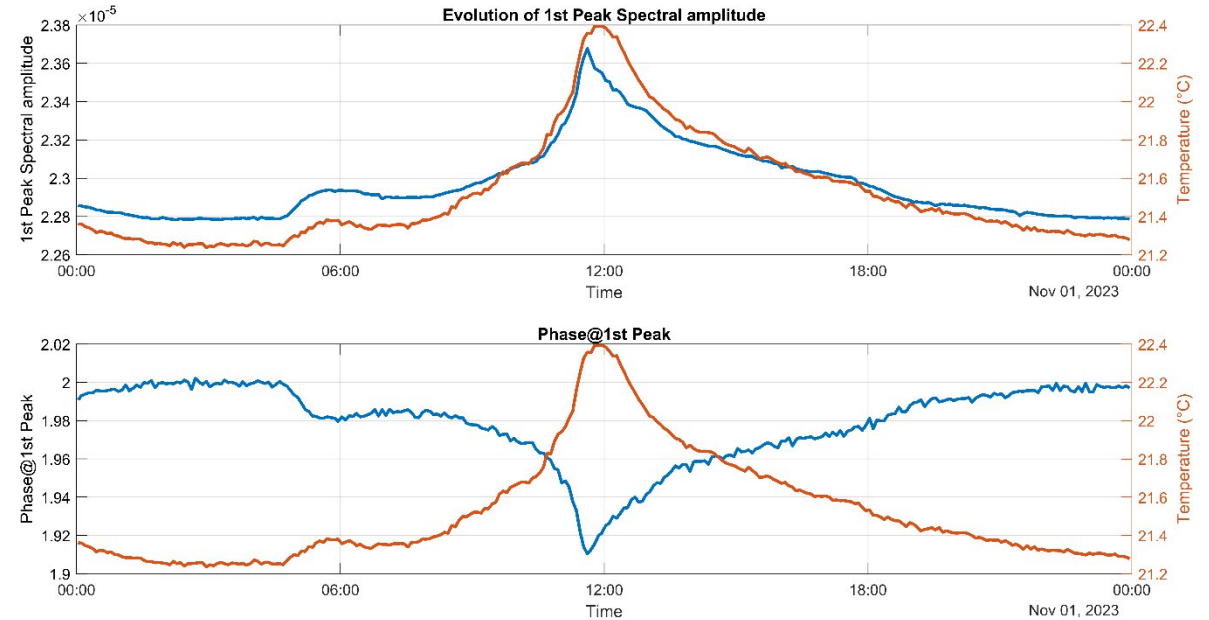**DeCorrelations - Using moving reference (with stretching)**
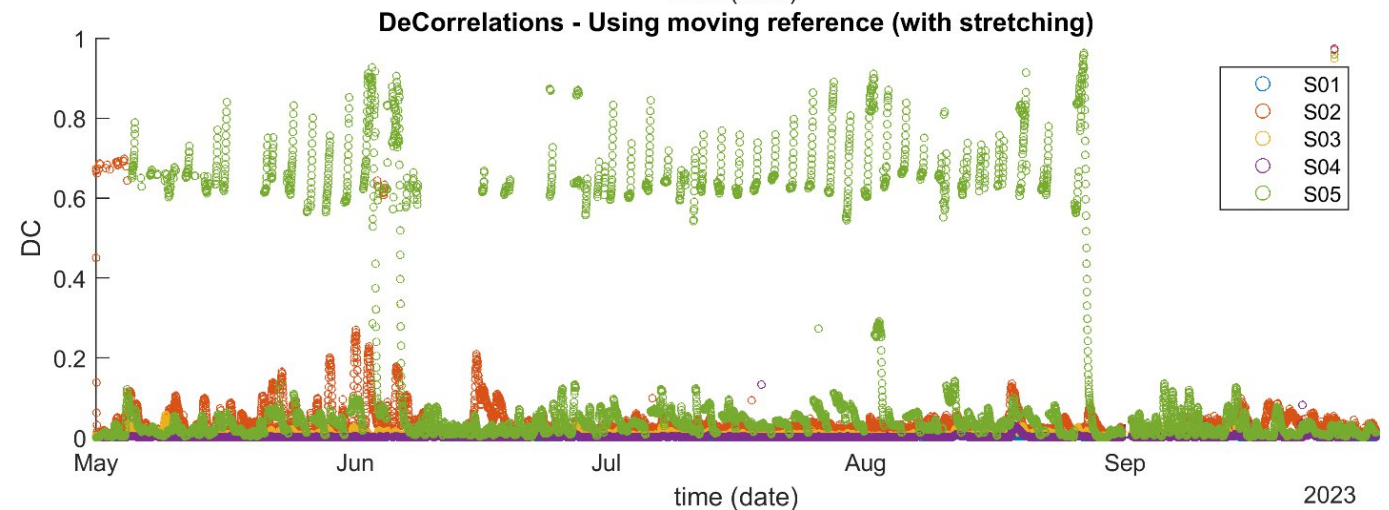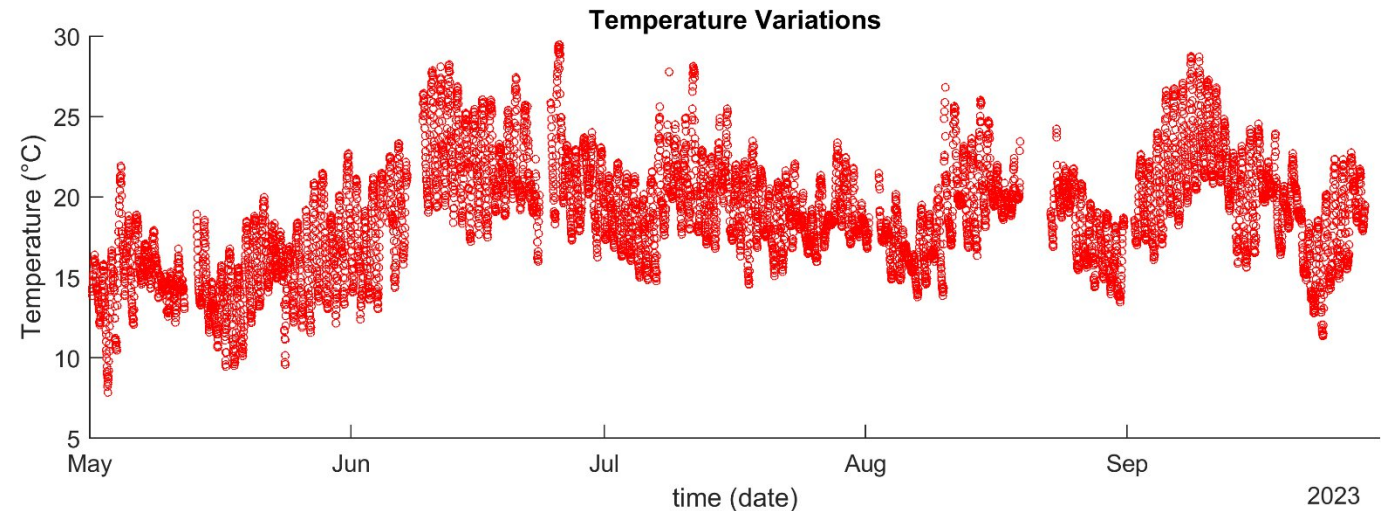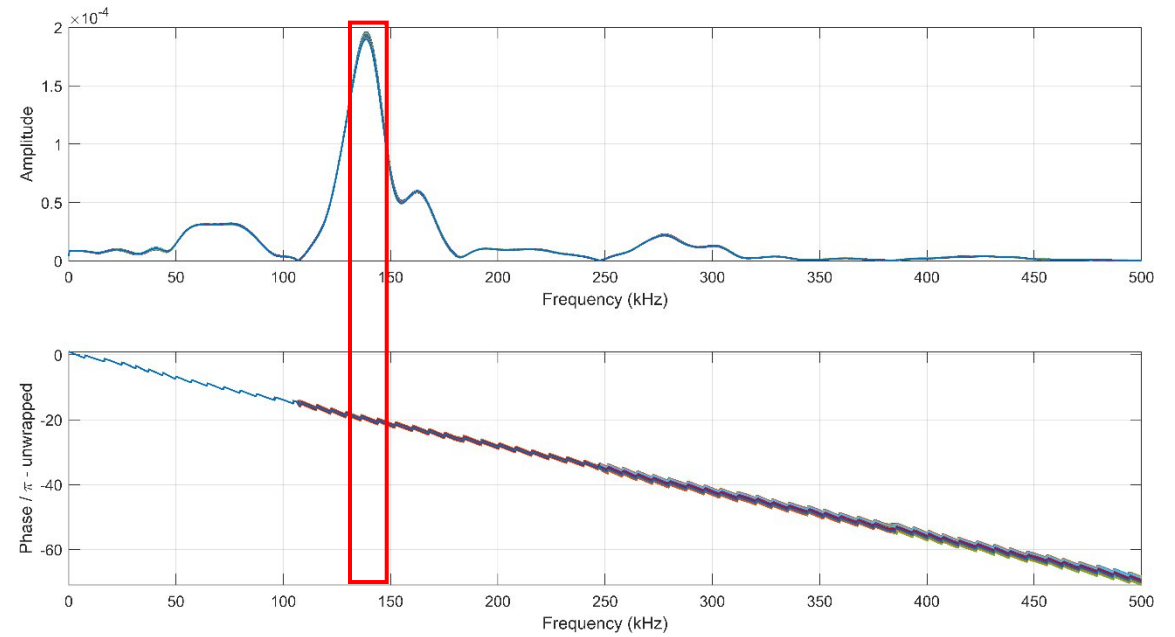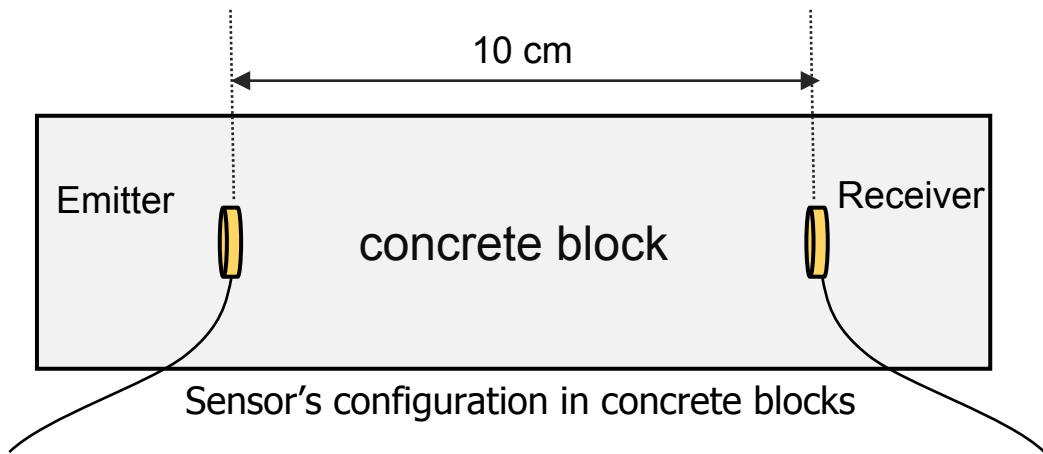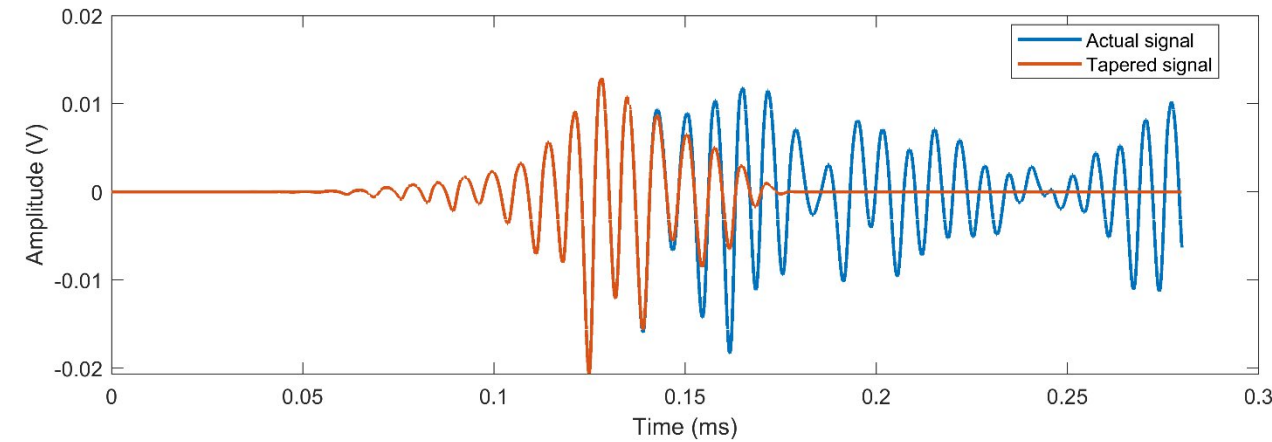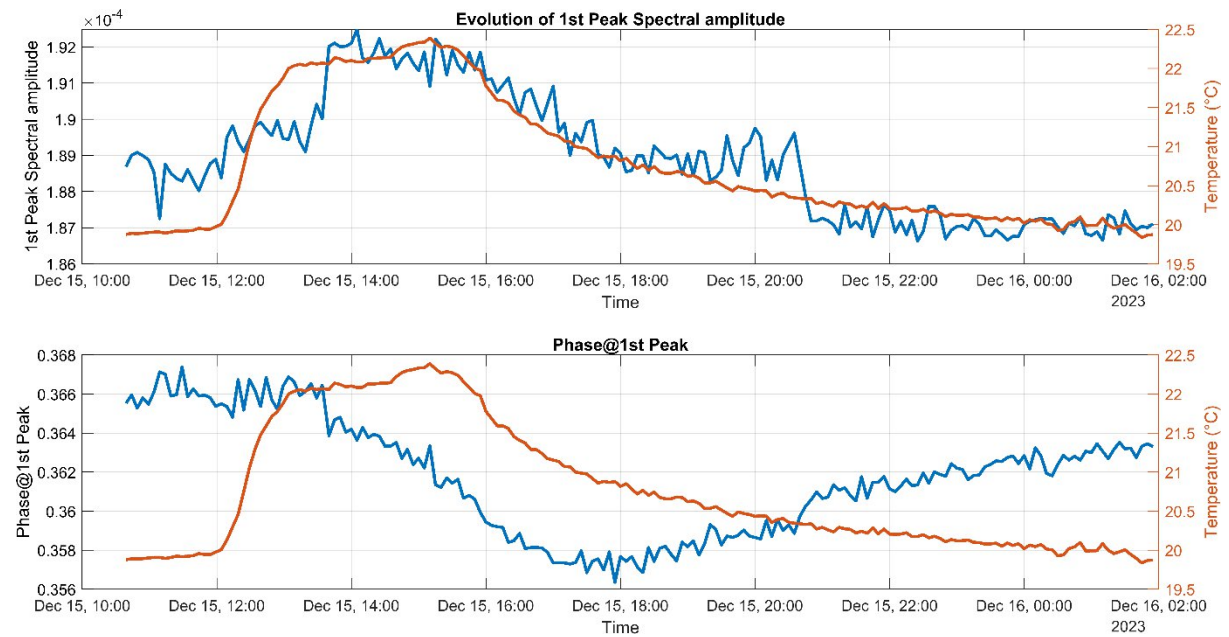
At ISAMGEO

Sensor's face-to-face configuration

Evolution of spectrum in 24 hrs (01-Nov-2024)

At ISAMGEO

Sensor's configuration in concrete blocks

Evolution of spectral amplitude in 16 hrs (15-Dec-2023 to 16-Dec-2023)

Conclusions and next steps

- Time-domain technique in tunnel data – has some limitations.

- Done some frequency domain features analysis

Next steps:

- Explore more frequency domain features

- Explore the features in wavelet domain

- How we could filter out effects of the temperature?

Thank you for your attention

DC08, Jitendra, Sharma

Université libre de Bruxelles (ULB)

Jitendra.kumar.sharma@ulb.be

Funded by the European Union