

Array beamforming on ambient seismic noise correlations reveals repeating direct waves in the coda

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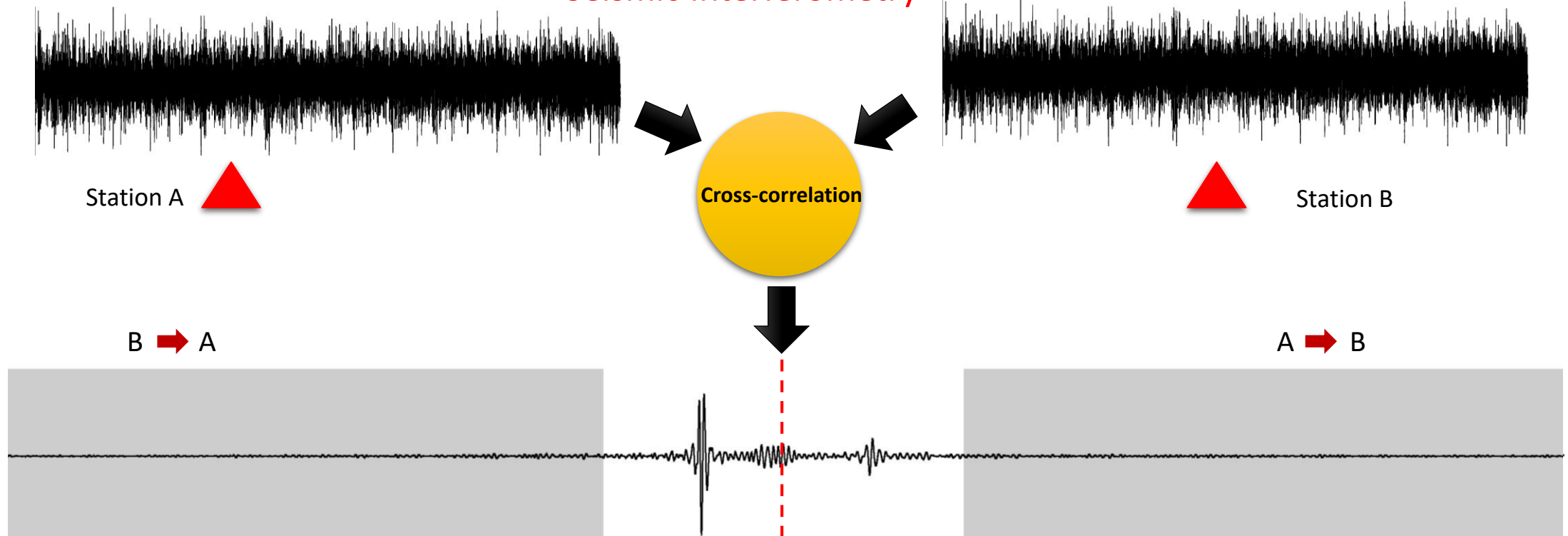
² Institut de Physique du Globe de Paris (IPGP), Université Paris Cité, Paris, France

Third SPIN Workshop & Short Course

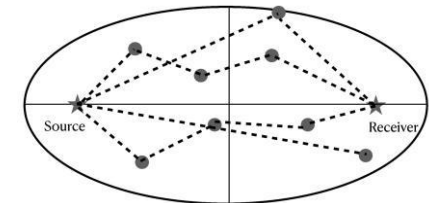
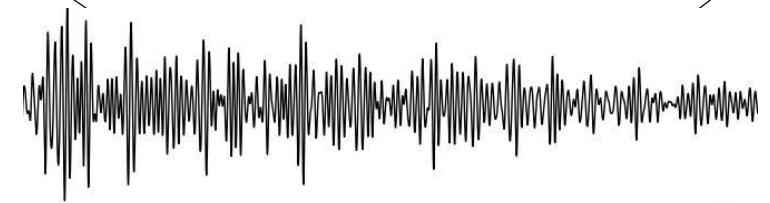
March 2023

Pitlochry, Scotland

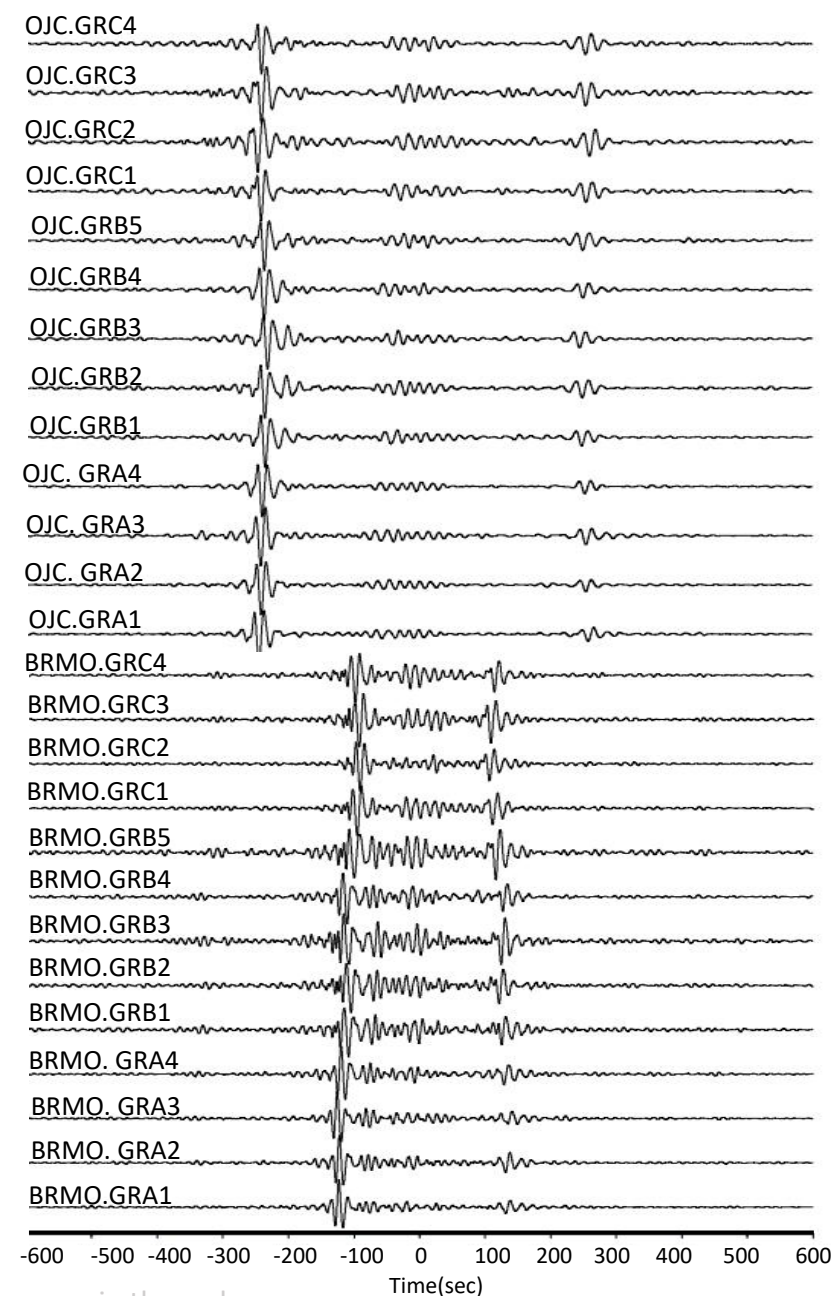
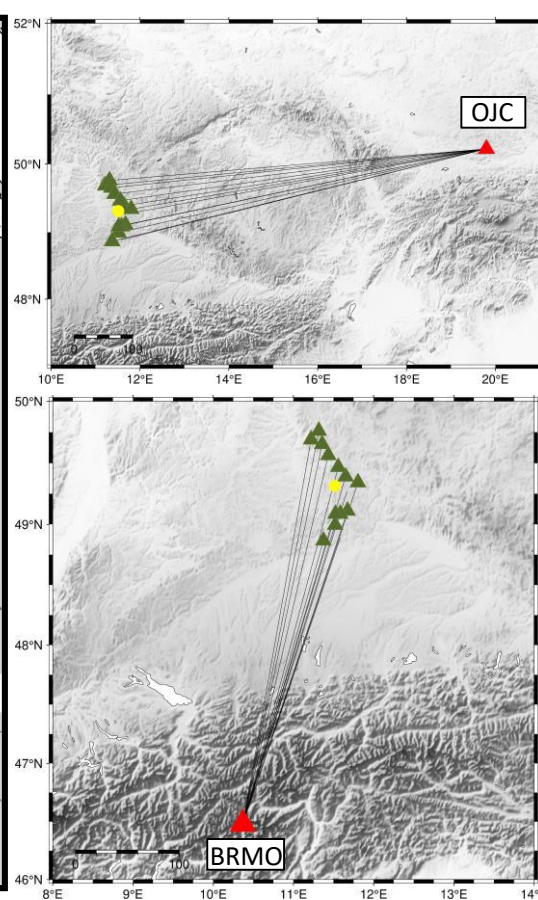
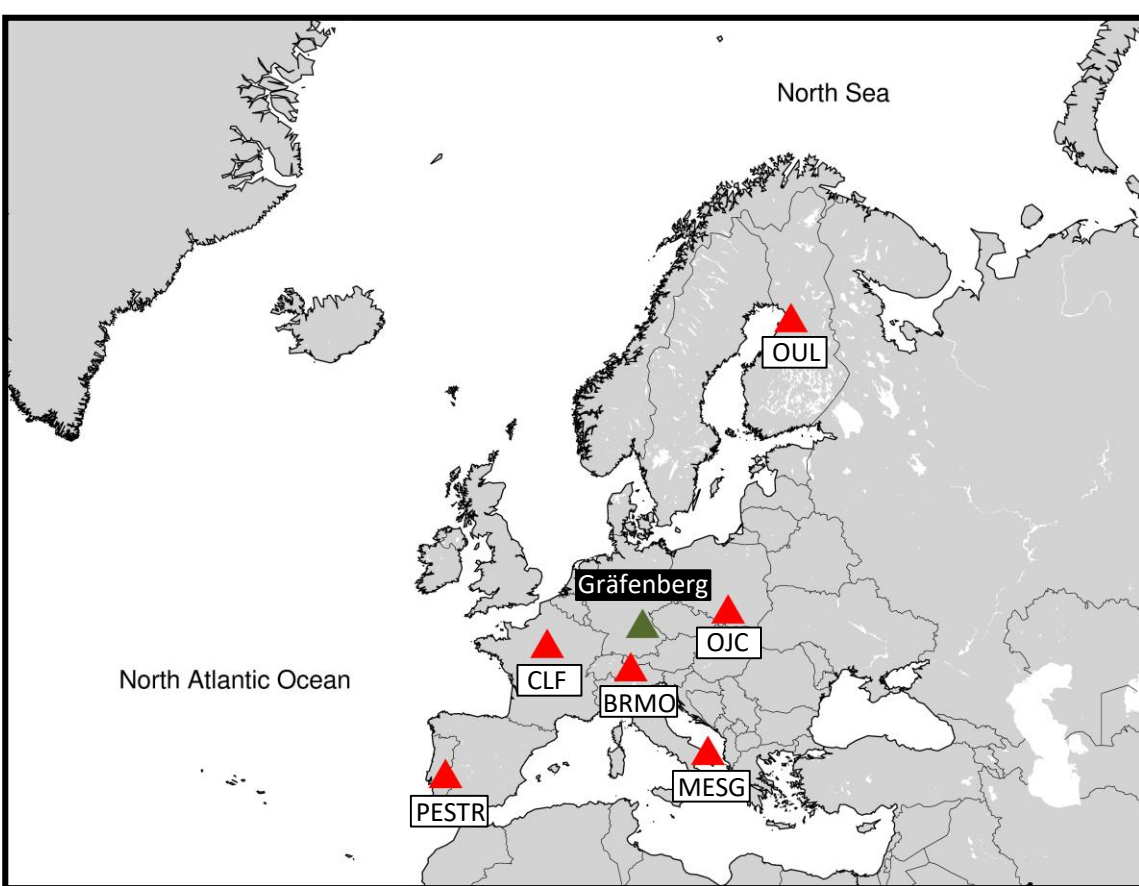
Seismic Interferometry



- Using wavefield recordings to create virtual seismic sources at locations
- Main contributions from **master station** to the retrieved **direct wave**
- **Coda waves** or late part of the correlation wavefield consists of multiple scattered waves, originating from the **master station** ?



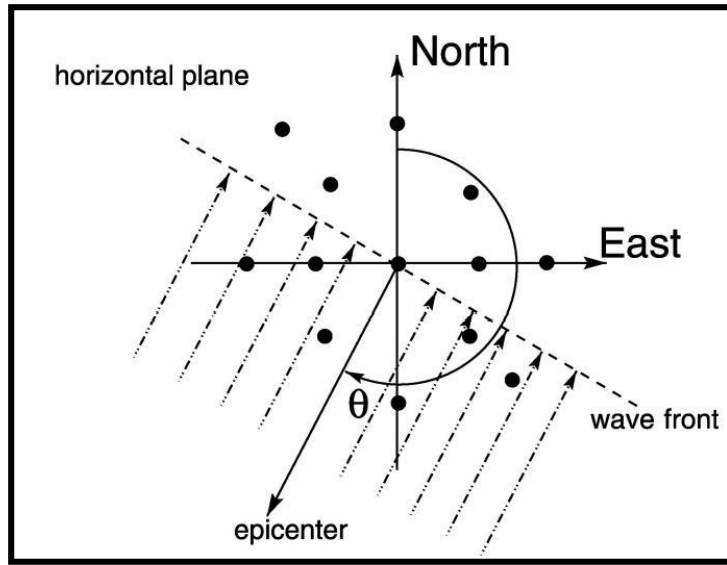
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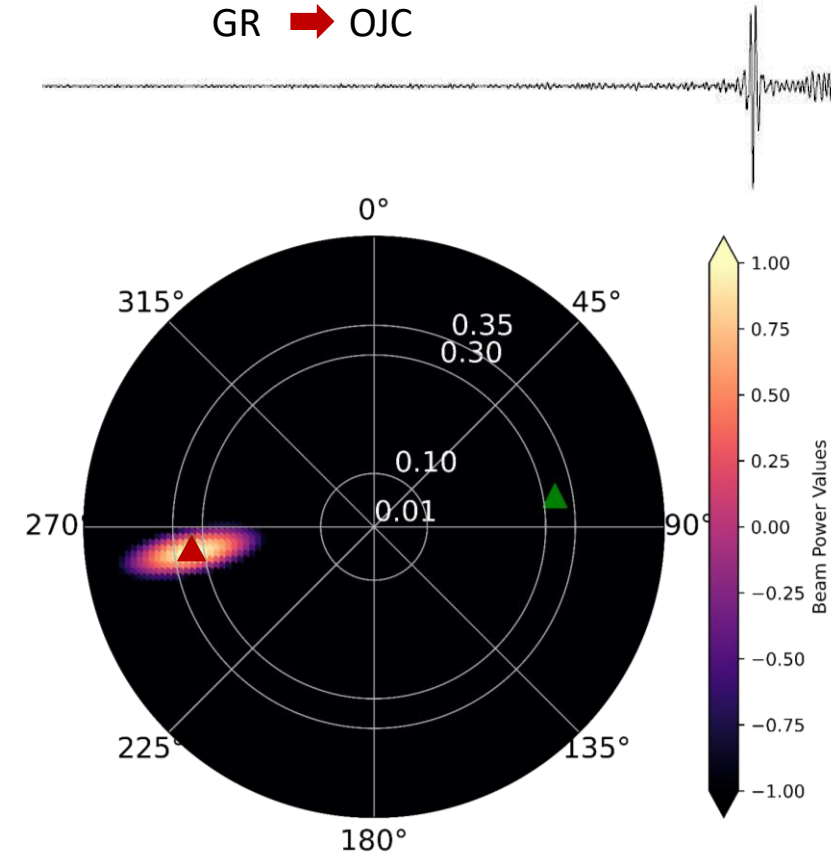
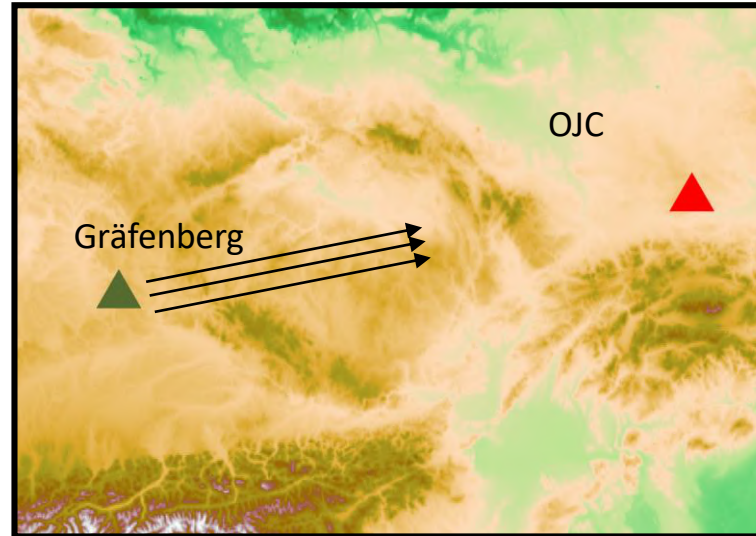
- Consideration of six master stations in Italy (IV-BRMO , IV-MESG), Poland (PL-OJC), Portugal (PM-PESTR), France (FR-CLF) and Finland (FN-OUL) with inter-station distances ranging between 326.676 to 1935.91 km.
- Computation of cross-correlation for two years continuous vertical component as outline Bensen et al., (2007):
 - 1 hour data segmentation
 - Time domain normalization and whitening
 - Apply bandpass filter in frequency band 0.05 -0.1 (Primary microseisms)

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Seismic Array Beamforming

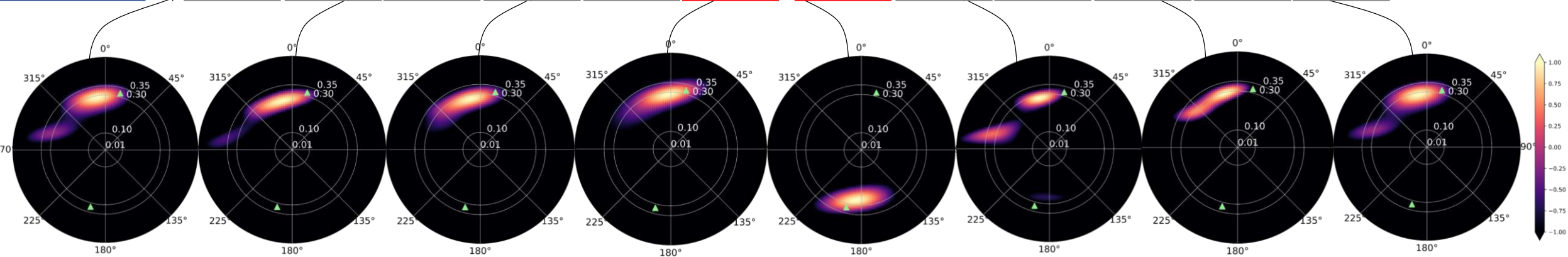
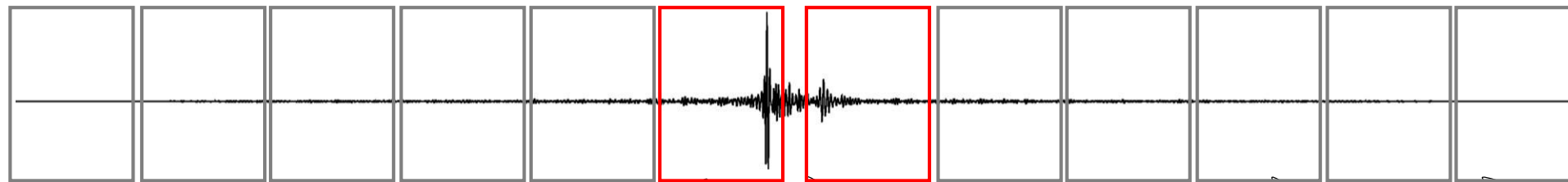
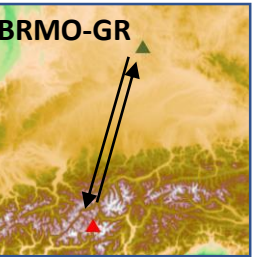
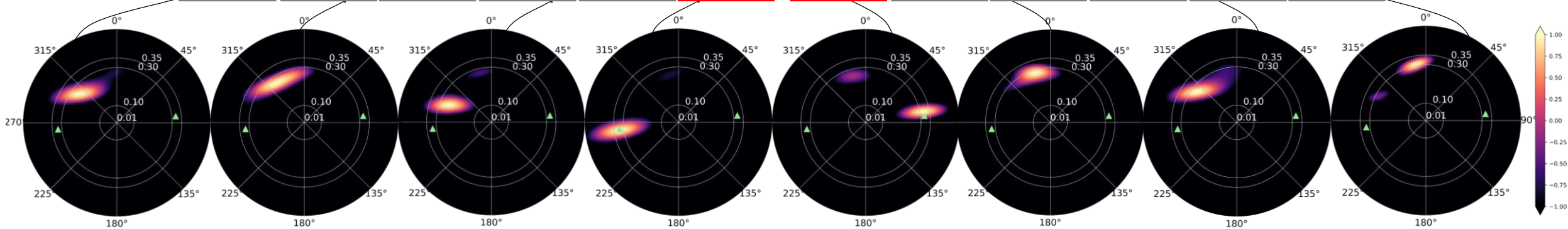
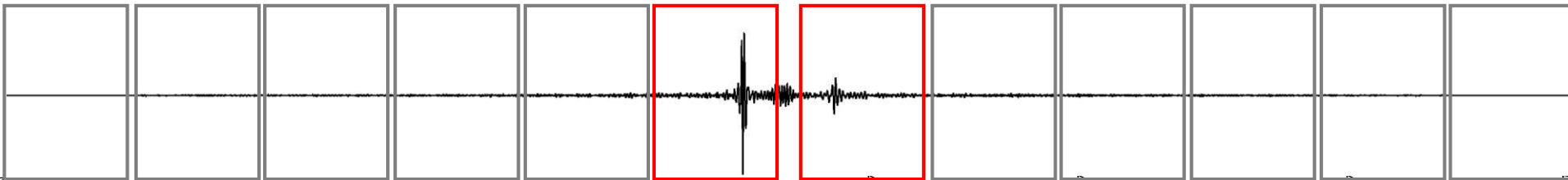
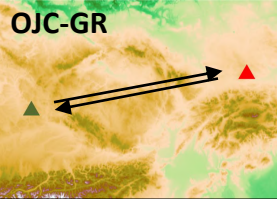


Rost & Thomas (2002)

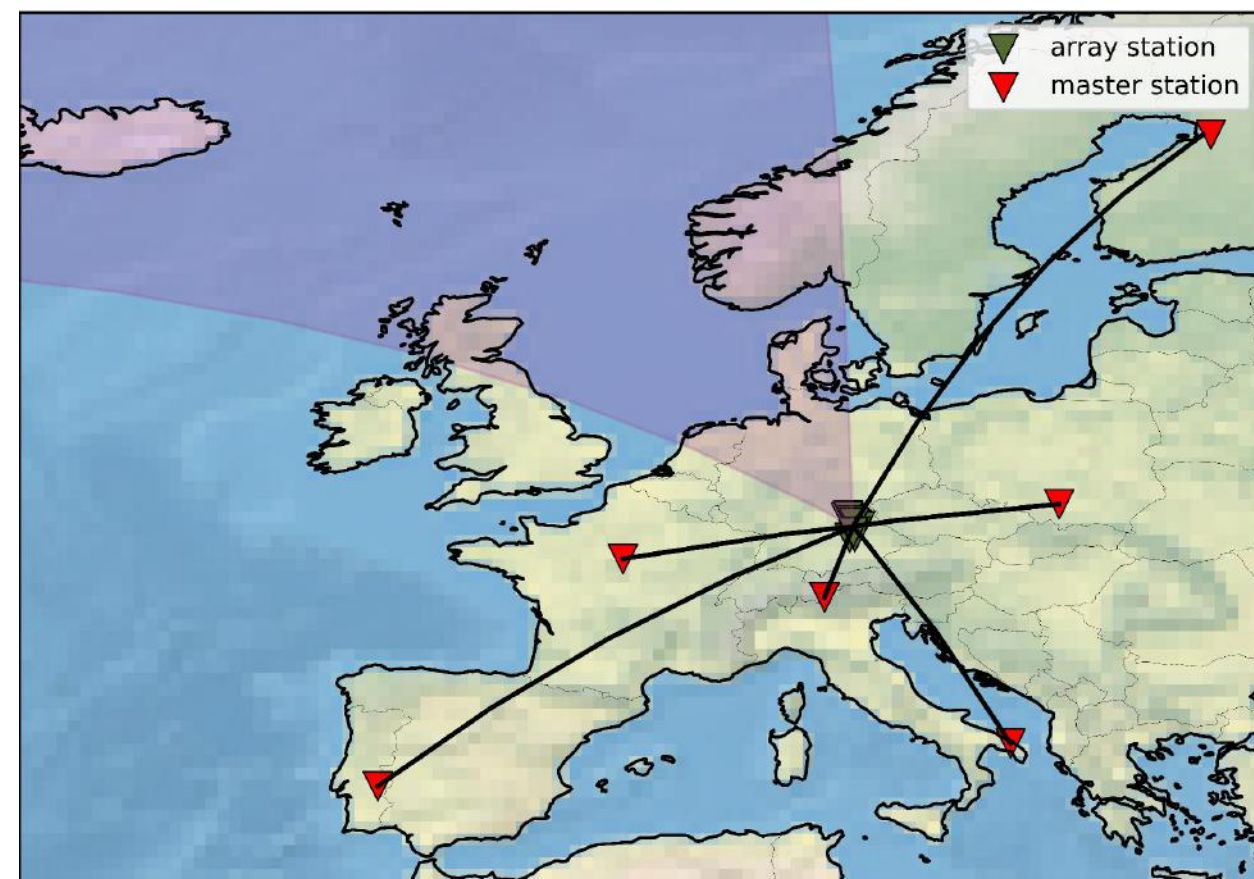


- Estimating the direction of arrival (azimuth) and slowness of the seismic waves

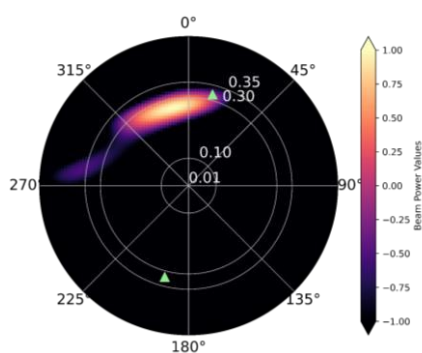
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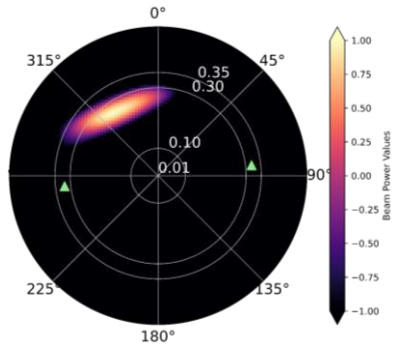
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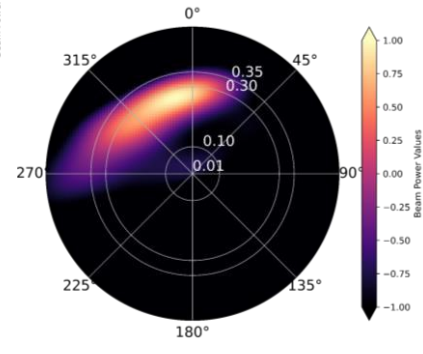
BRMO-GR (Negative lag side)



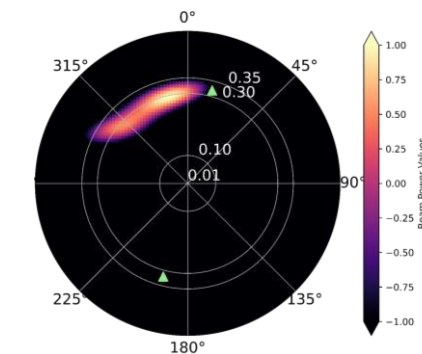
OJC-GR (Negative lag side)



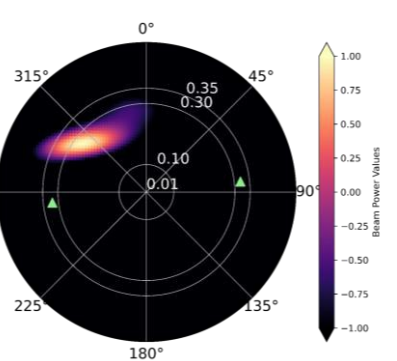
Raw data



BRMO-GR (Positive lag side)



OJC-GR (Positive lag side)



In Conclusion:

- Isolated noise sources may have significant implications for monitoring applications that impact the coda of correlation functions.
- The origin of the coda wavefield illustrates its spatial sensitivity



Schippkus et al., 2023. (Submitted)

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