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Lightning Talk:

Monitoring of hard rock environment using ambient seismic noise

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Our first goal: Observe Earth Tides from Cross-Correlations

- previous studies: use either Autocorrelation or a mix of Cross-Correlation and Autocorrelation
 - **challenges:**
 - Autocorrelation
 - studies from regions close to the ocean (Ocean Tides vs. Earth Tides?)
 - **solution ideas:**
 - looked for data from a quiet place in the middle of a continent
 - use pure Cross-Correlation instead of Autocorrelation

Idea and Methodology?

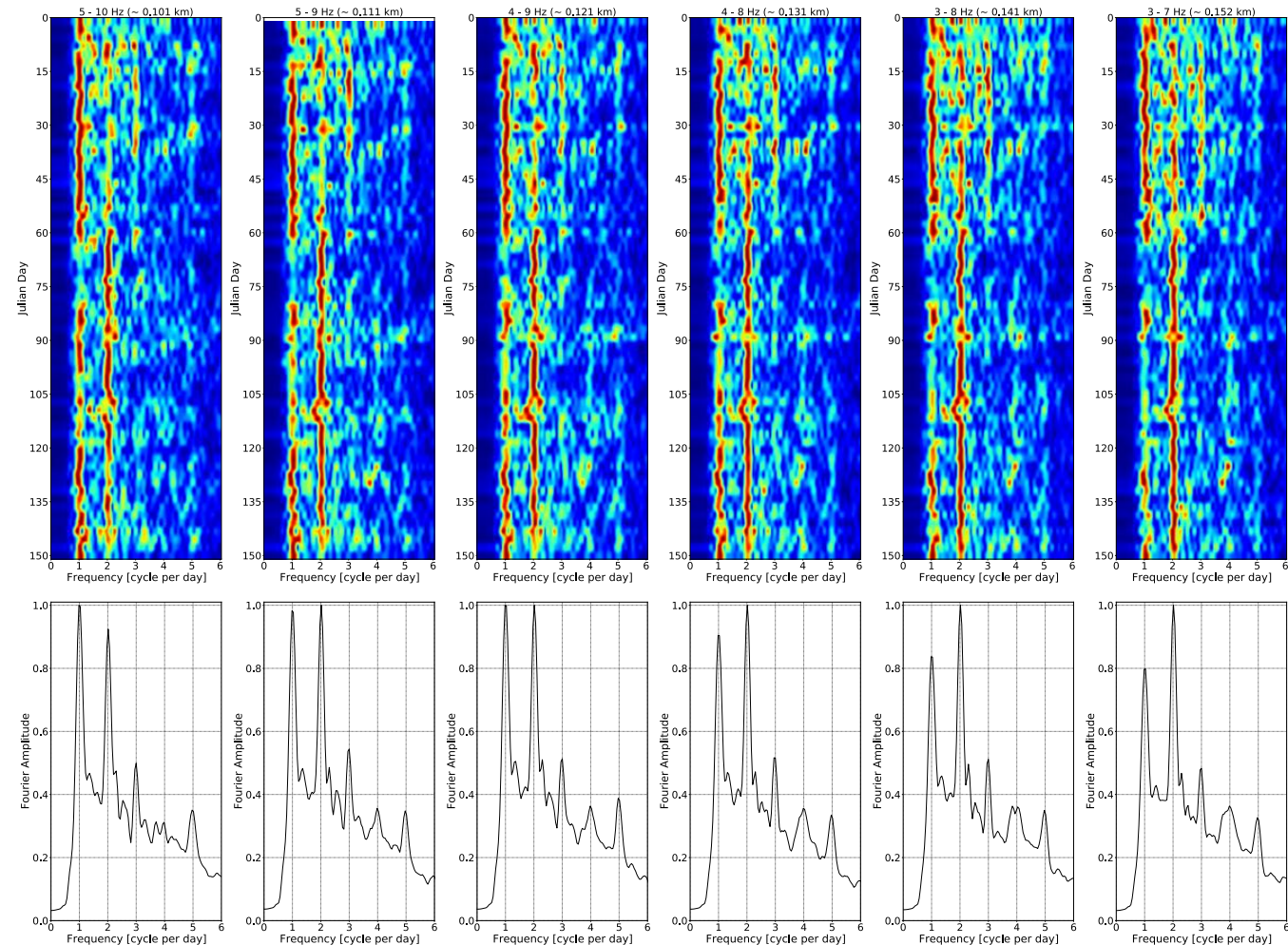
- monitoring of the subsurface behavior by using continuous ambient seismic noise
- Investigation can be divided into three steps:
 - (1) estimation of Green's function from continuous ambient noise data
 - (2) calculation of relative seismic velocity changes (dv/v) in different frequency bands
→ different depth sensitivity of the coda waves
 - (3) spectral analysis of the resulting dv/v in a five days sliding window to reveal frequency contain

Expectations vs. Reality

- we expect a periodical behavior of the dv/v (shown in e.g. Mao et al. 2019, Sens-Schönfelder and Eulenfeld, 2019)
 - assumption: strongest effects deforming the shallow crust show the same periodical pattern (Temperature or Earth Tides)
 - expectation: frequency spectrum of dv/v shows strong 1 cycle per day and 1.93 cycle per day peak
- reality:
 - every calculated spectra (from various years, methods, regions, ...) are missing the 1.93 cycle per day peak (sometimes it's there, but weak)
 - instead showing a strong 2 cycle per day

Expectations vs. Reality

- which effect are we looking at?
 - temperature still possible
 - Earth tides not possible would show a strong 1.93 cpd peak instead of 2 cpd
- possible effect: **atmospheric tides**
 - strong 1 cpd and 2 cpd
 - strongest effect if water is included



What does it mean? Perspectives?

- dv/v measurements strongly effected by the presence of water/aquifers in the near surface (pore pressure effects)
- geothermal reservoir monitoring should show a strong background noise from this deformation by the atmospheric tides
- influence of the Earth Tides smaller than expected?
- link to hydrogeophysics? Can we characterize groundwater aquifers by monitoring dv/v ?



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Thank you for your attention!
