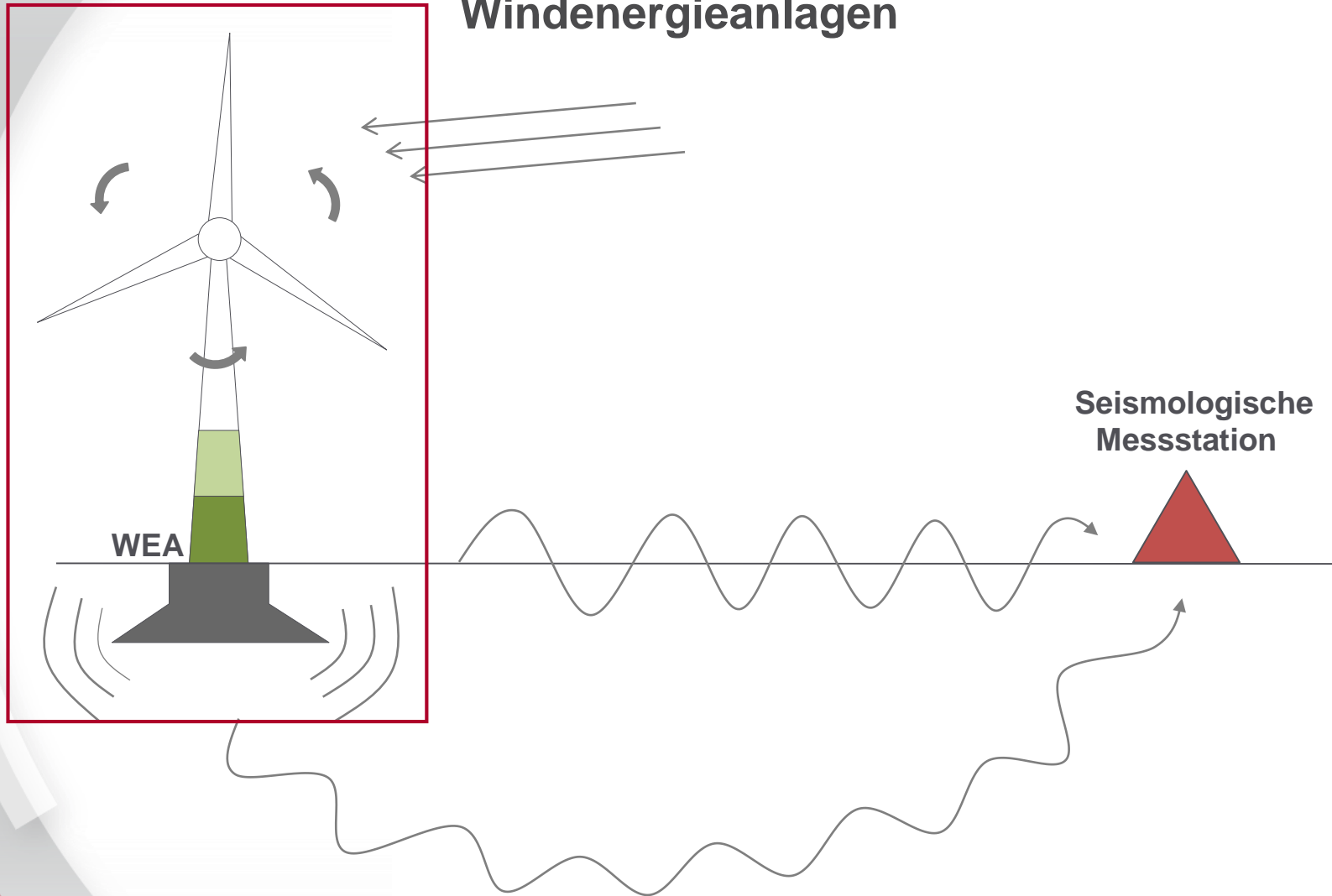




Tobias Neuffer
13. Dezember 2018

AP 1: Untersuchung der Schwingungsemissionen im Nahfeld von Windenergieanlagen



- Bürgerwindpark A31 Hohe Mark
- Drei Enercon E-115 Anlagen
- Leistung: 3 MW
- Nabenhöhe: 149 m
- Rotordurchmesser: 115.7 m
- Inbetriebnahme: 09/2017



Quelle: Bürgerwindpark A31 Hohe Mark



Quelle: Bürgerwindpark A31 Hohe Mark

Messkonfiguration

- 17 Messanlagen
- 4 Wochen (November)
- 4.5 Hz Sensoren (40 dB Pre-Amp)
- 5 Stationen in 100 m
- 10 Stationen in 200 m
- 2 Stationen am Fundament

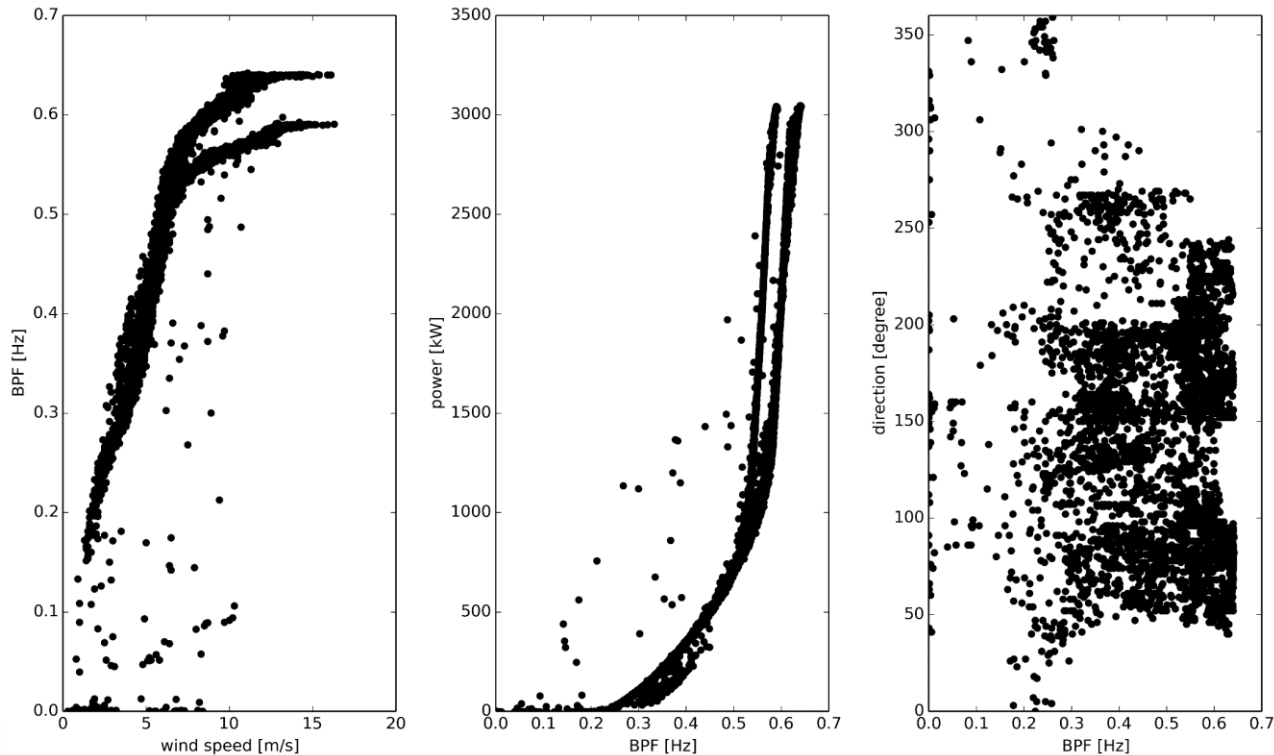




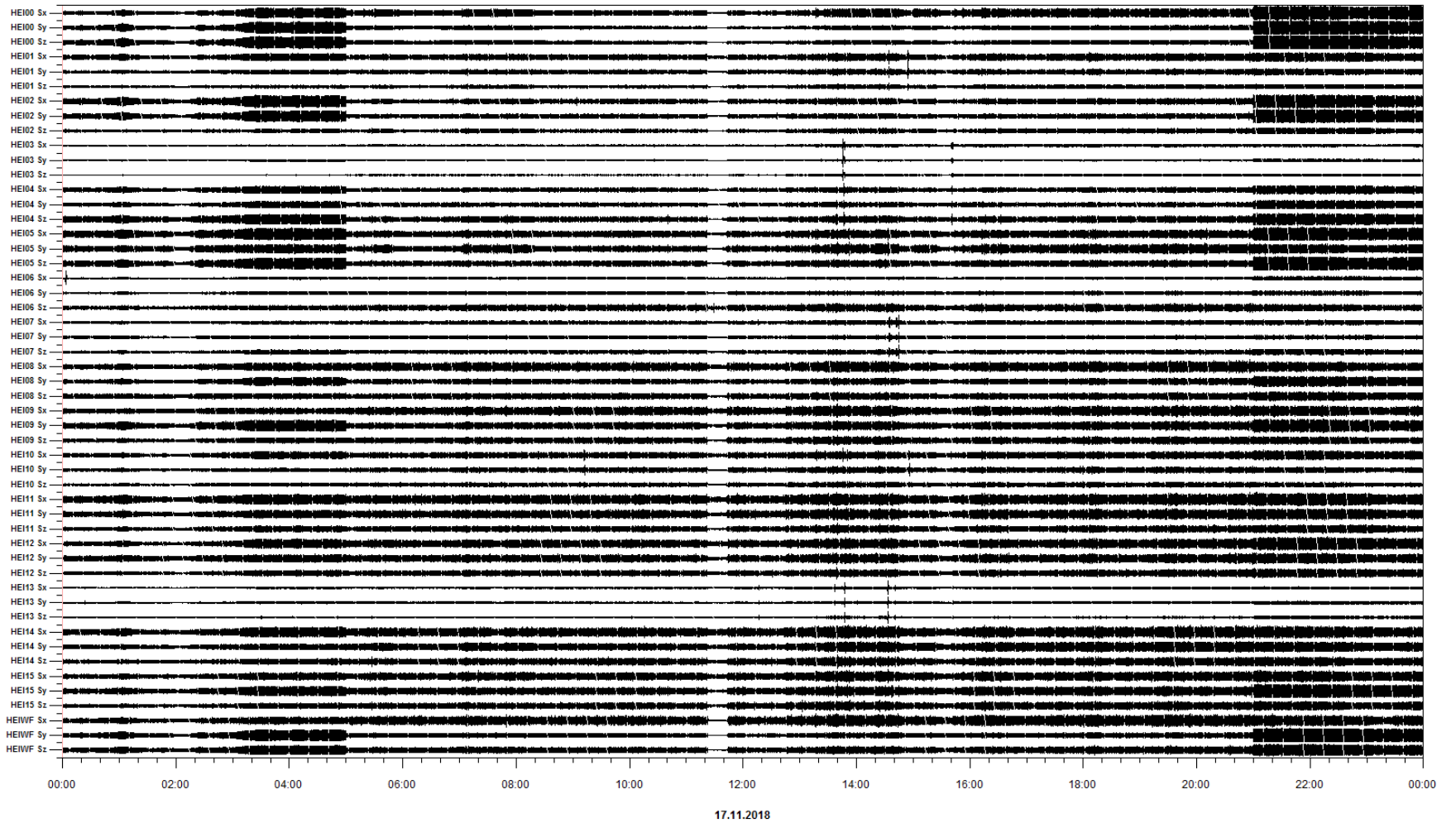


Betriebsdaten

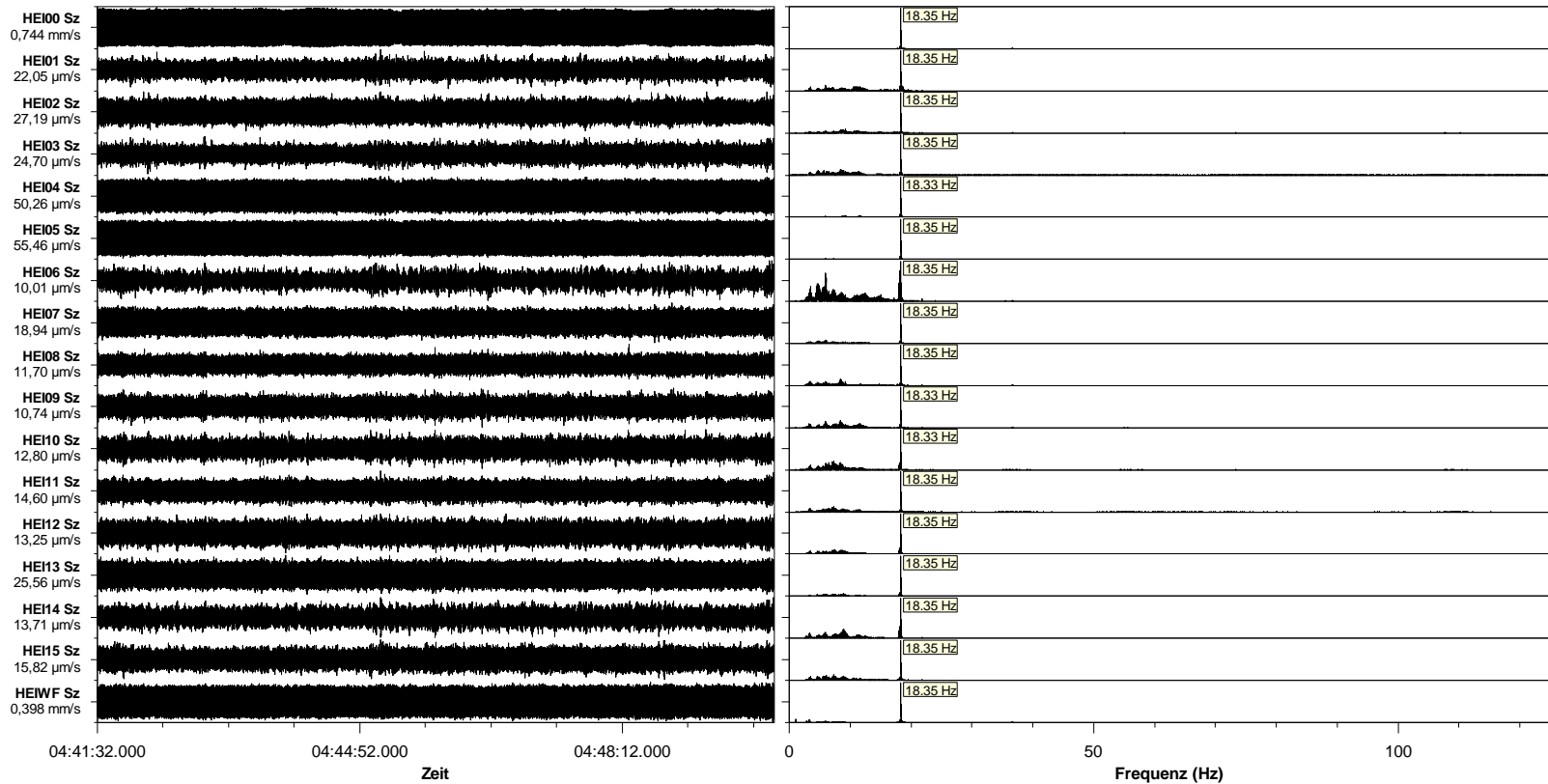
- Betriebsdaten: 10 min – Auflösung
- 720 h Daten
- ~ 693 h Anlage in Betrieb
- ~ 39 h bei Nennleistung
- ~ 27 h Anlage ausgeschaltet



Aufgezeichnete Daten

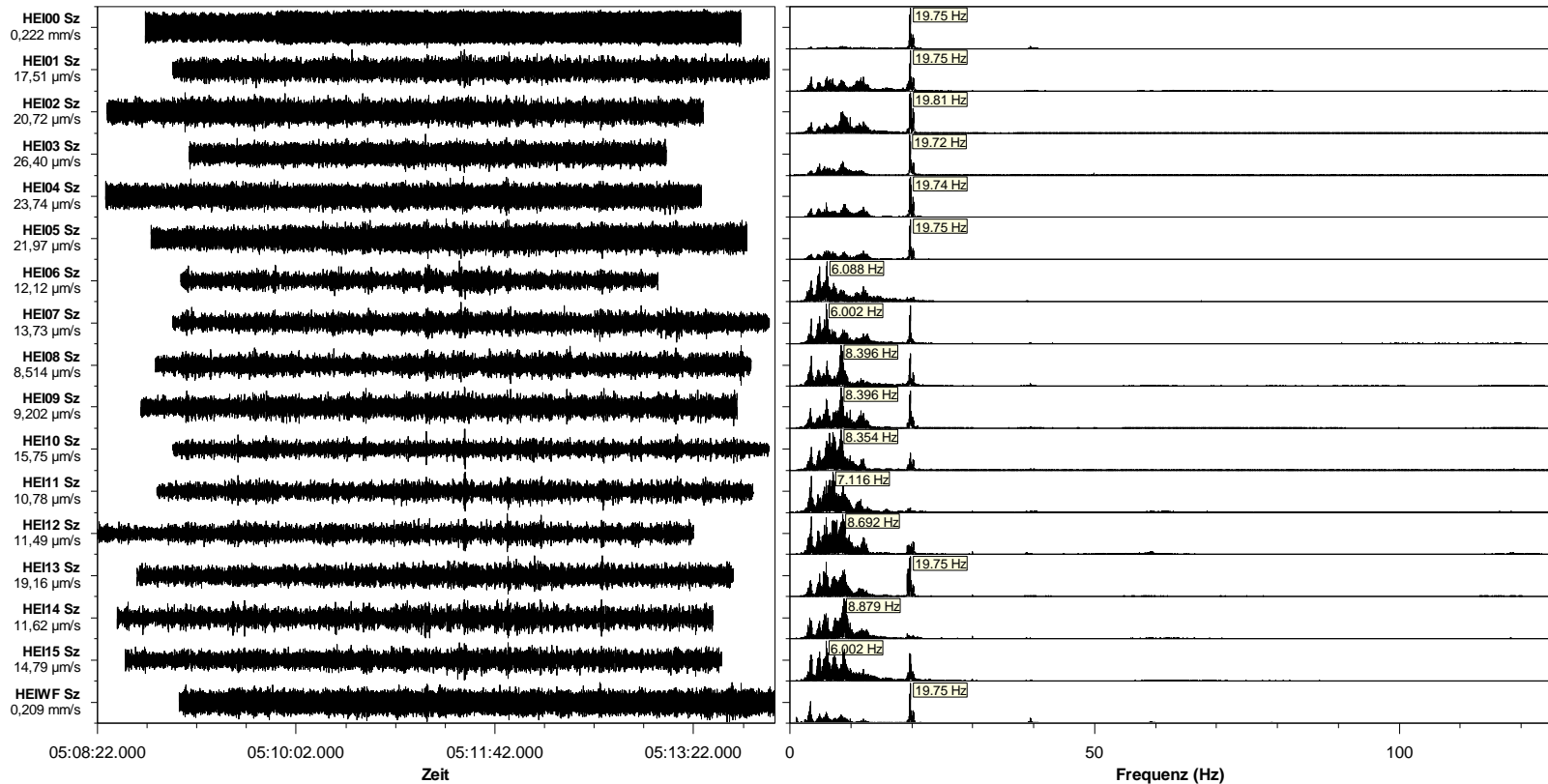


Aufgezeichnete Daten



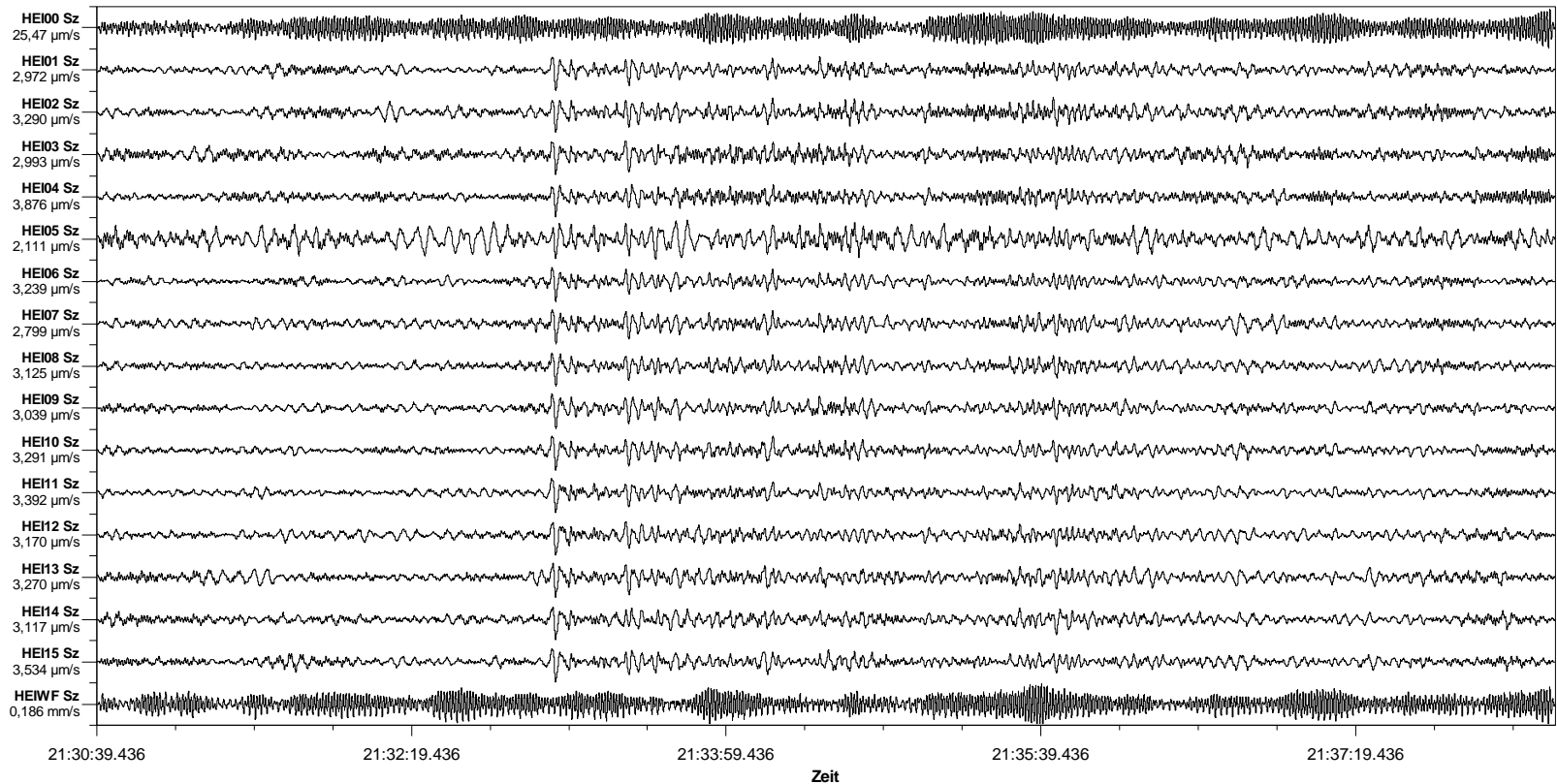
- Windgeschwindigkeit: 12.1 m/s
- Leistung: 2.6 MW
- Rotation: 11.4 U/min

Aufgezeichnete Daten



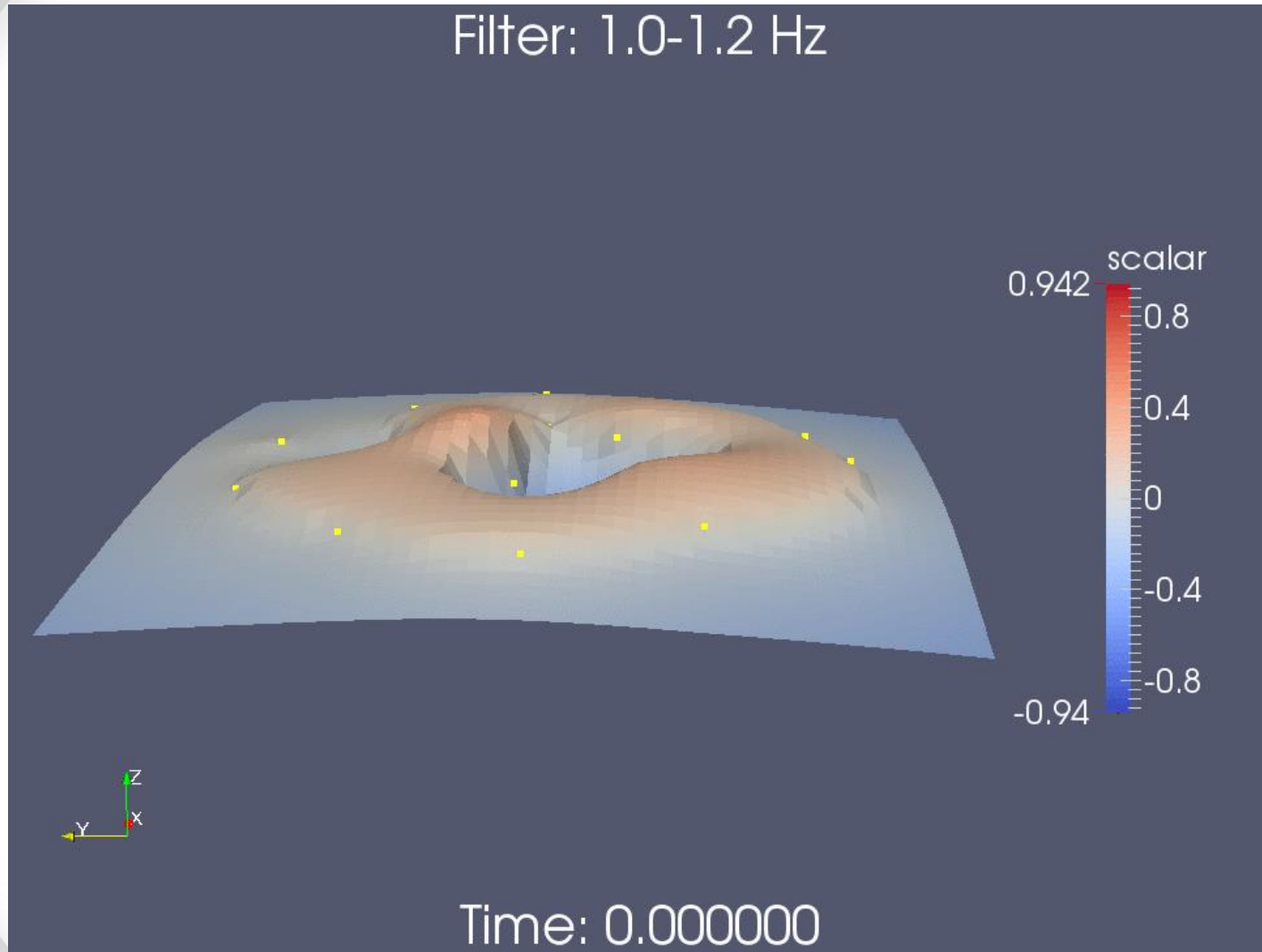
- Windgeschwindigkeit: 11.3 m/s
- Leistung: 2.9 MW
- Rotation: 12.4 U/min

Aufgezeichnete Daten

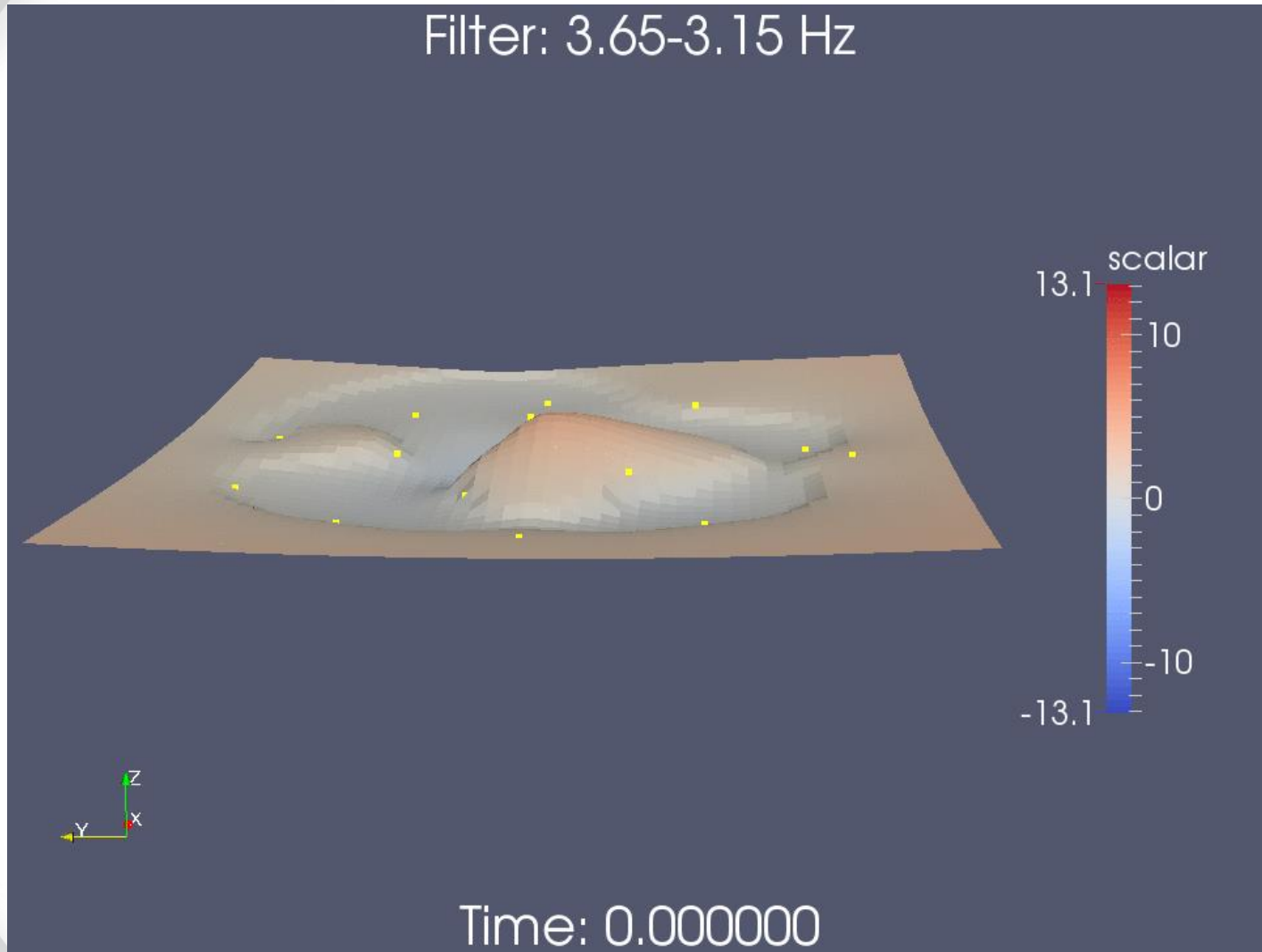


- mww = 6.0 (USGS)
- Ust'-Kamchatsk Stary (Russia)
- BP filter: 0.2 – 2.0 Hz
- Rotationsfrequenz: 10.9 U/min

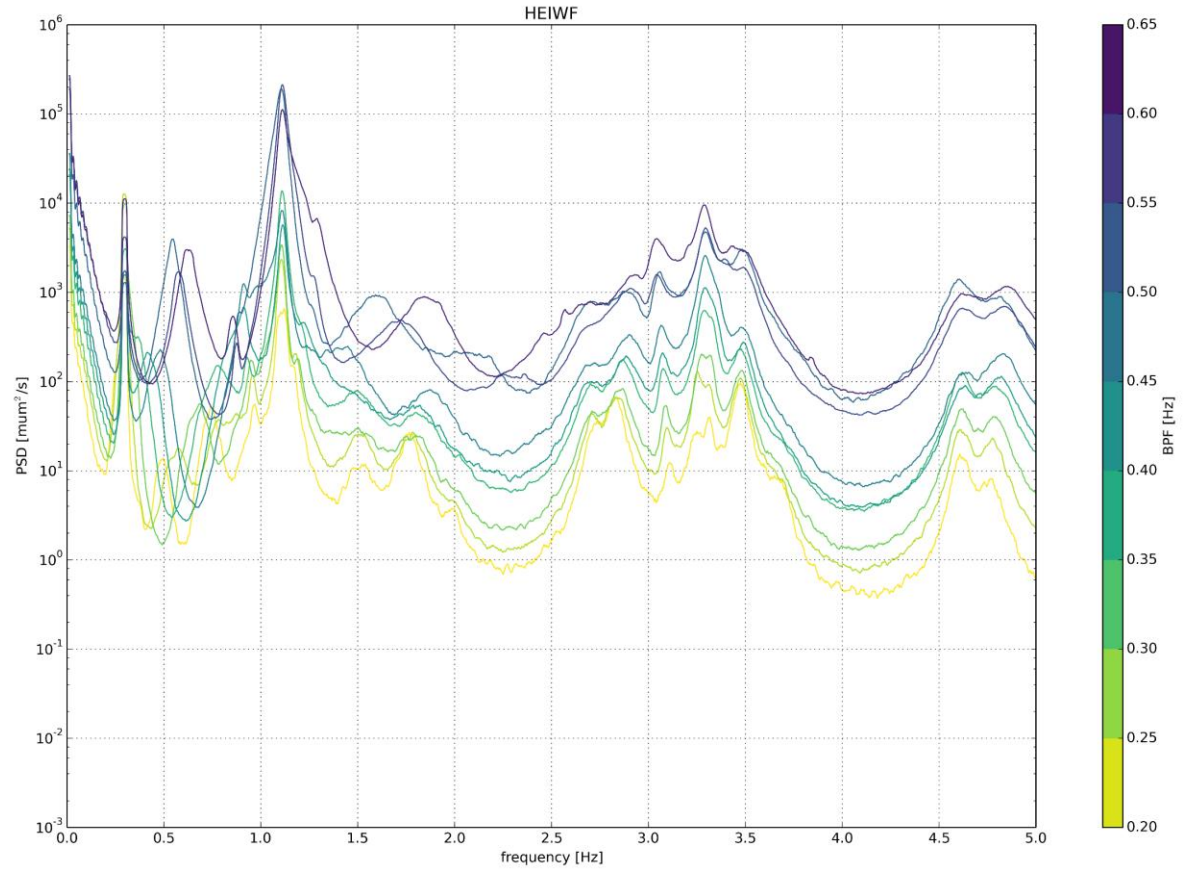
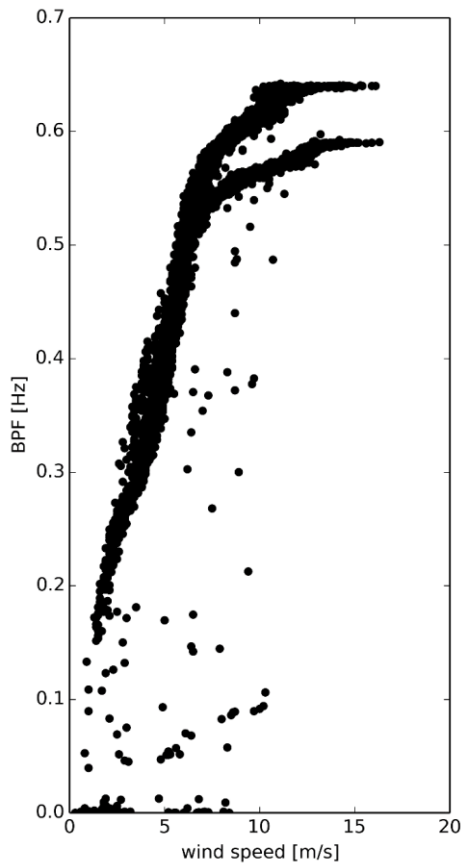
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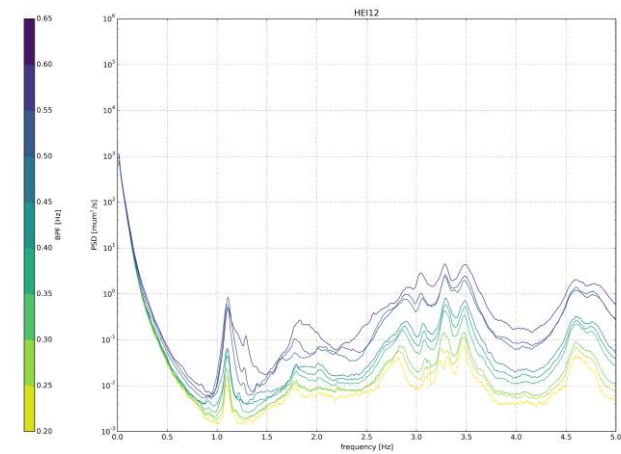
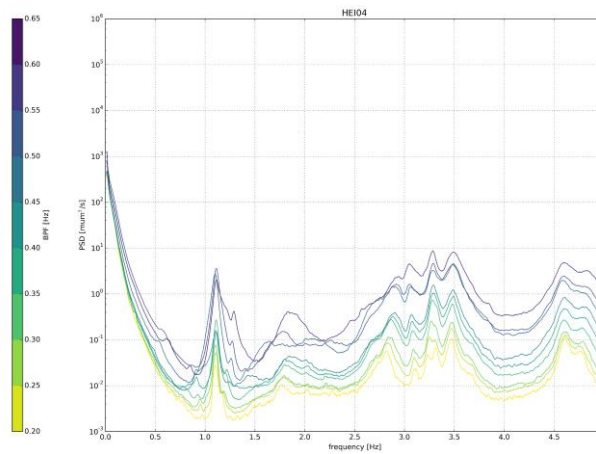
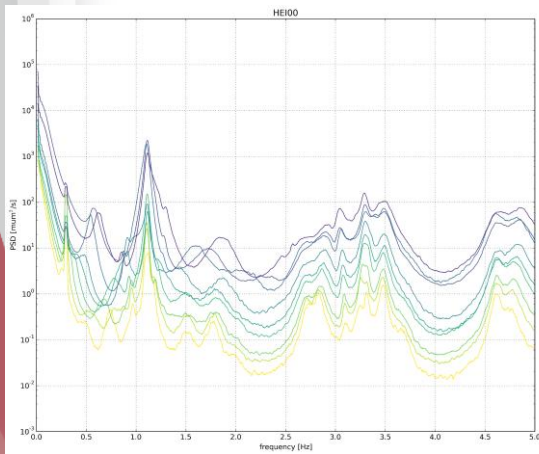
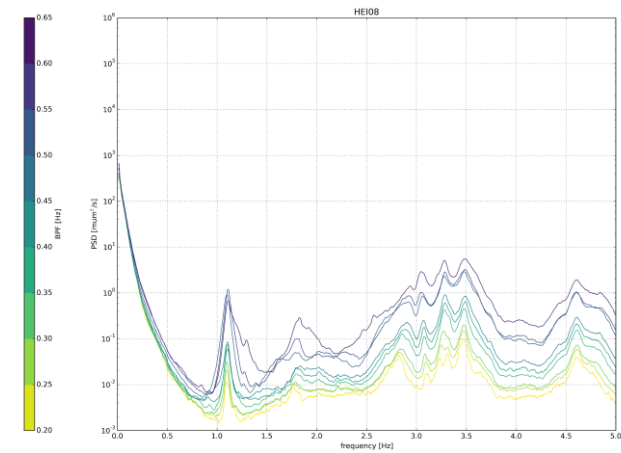
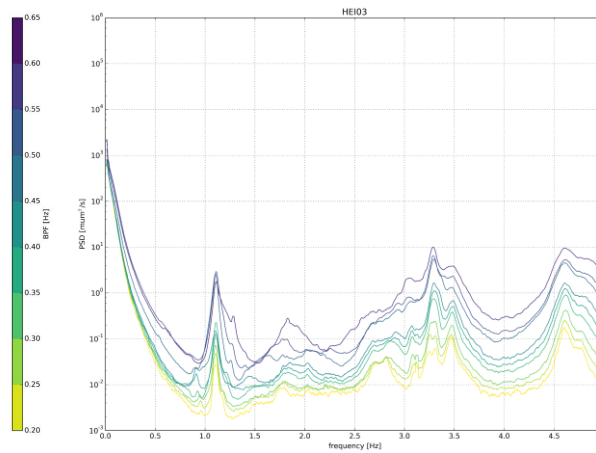
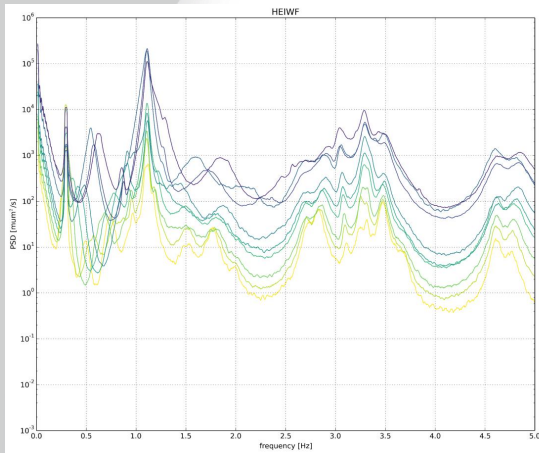
Aufgezeichnete Daten



PSDs korreliert



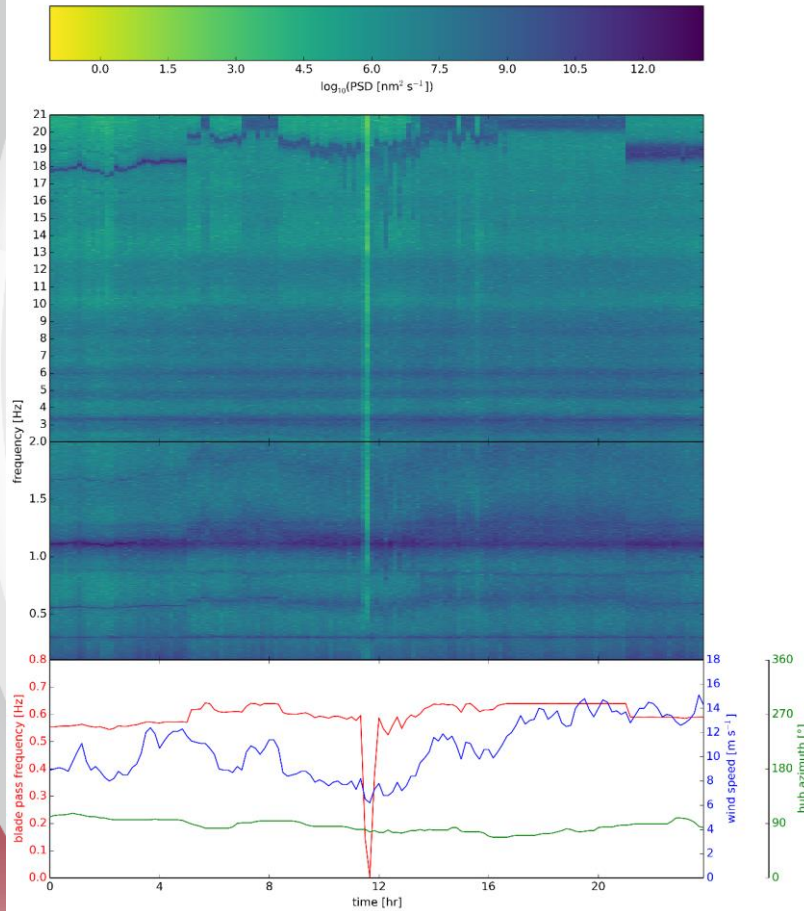
PSDs korreliert



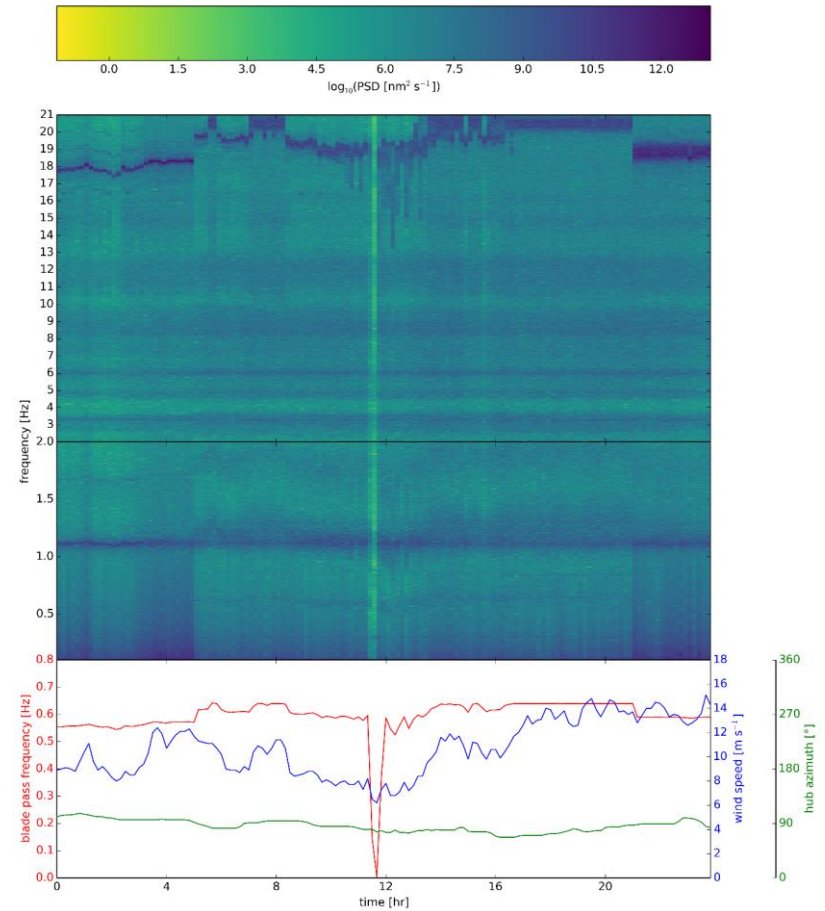
PSDs korreliert

Tagesansicht 17.11.2018

HEIWF



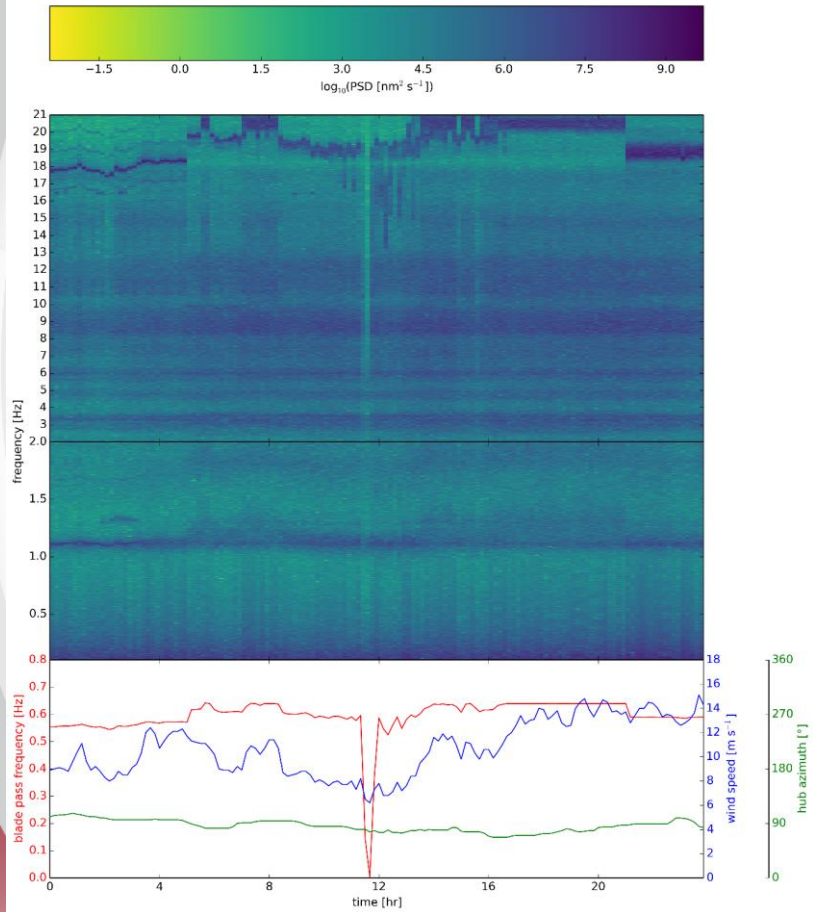
HEI00



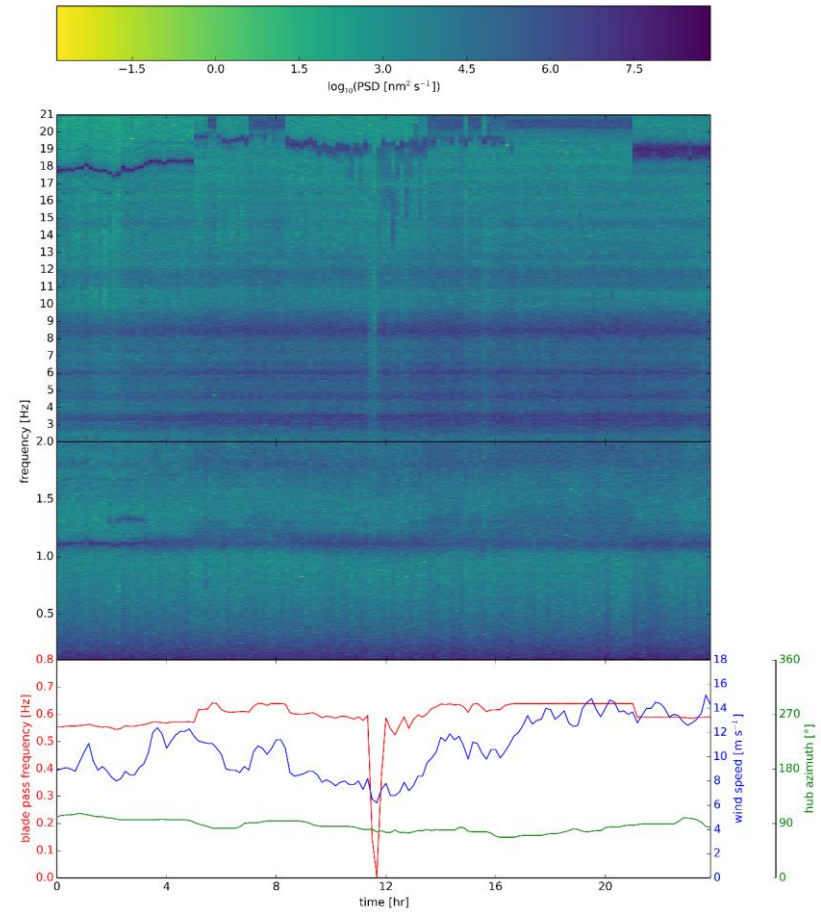
PSDs korreliert

■ Tagesansicht 17.11.2018

HEI02



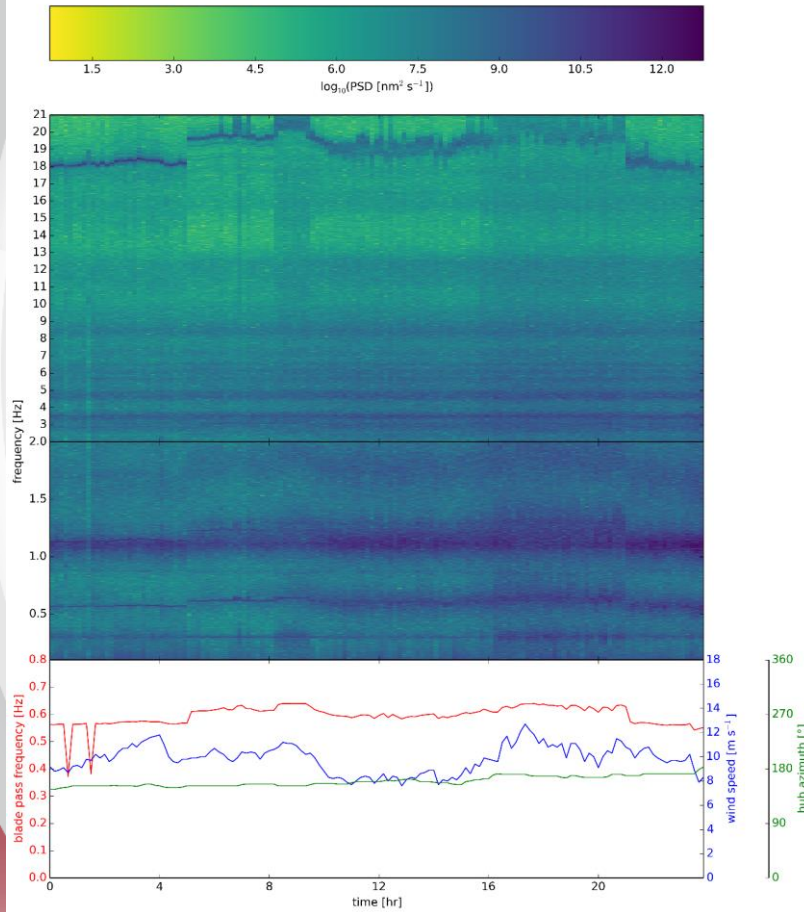
HEI08



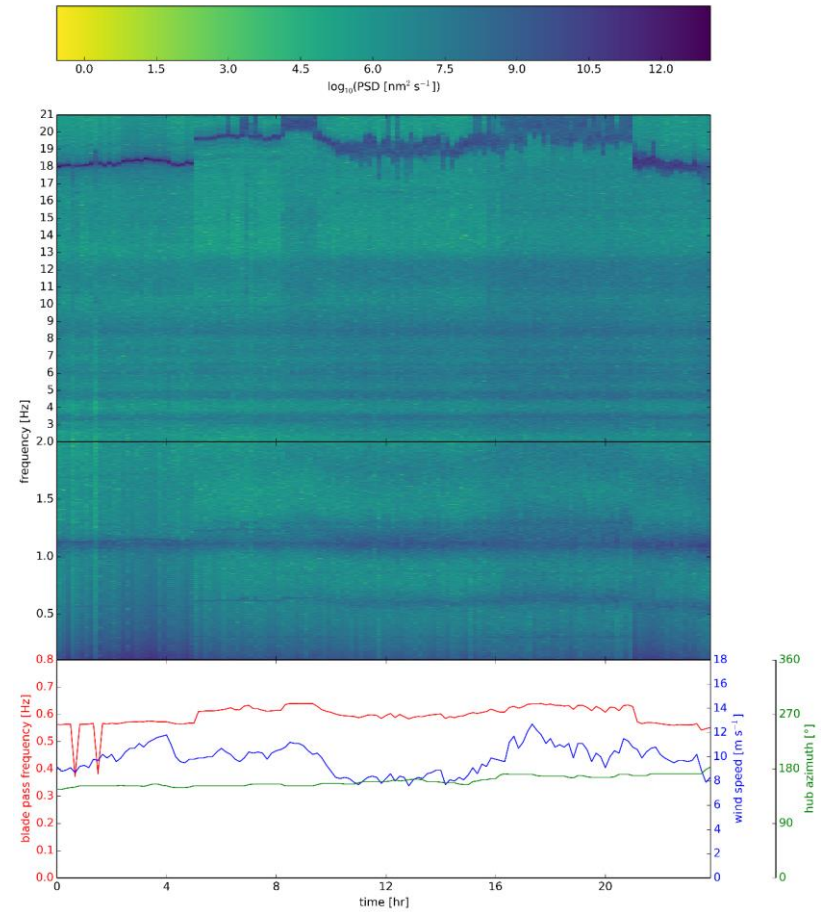
PSDs korreliert

■ Tagesansicht 28.11.2018

HEIWF



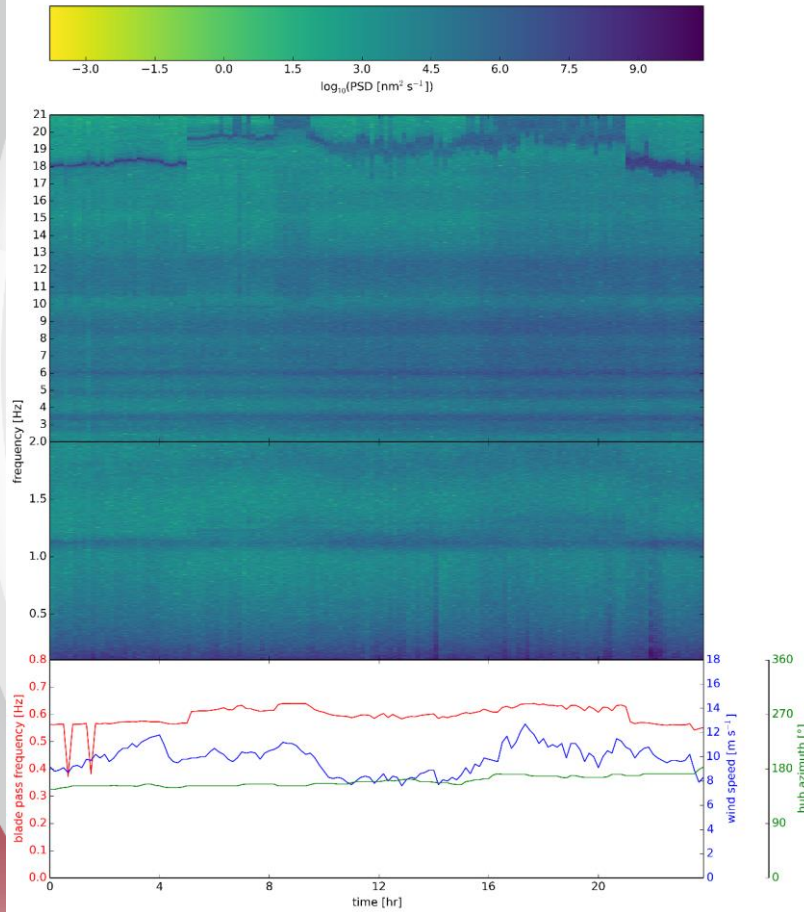
HEI00



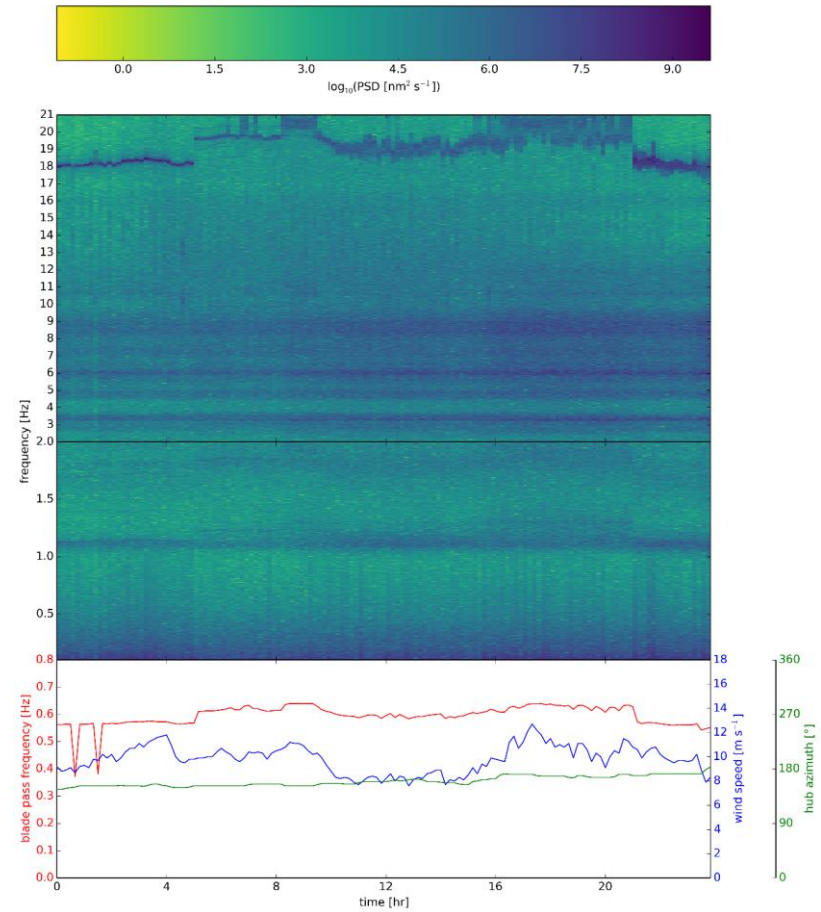
PSDs korreliert

■ Tagesansicht 28.11.2018

HEI05

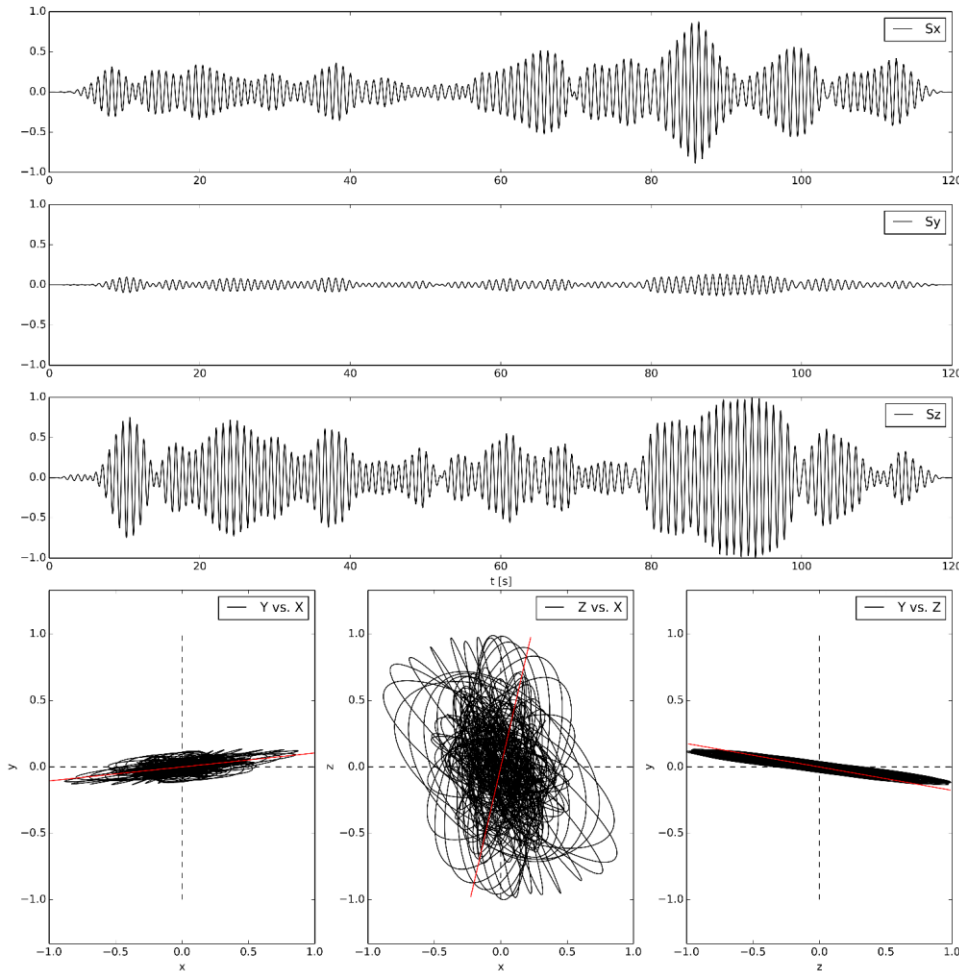


HEI15



Particle motion

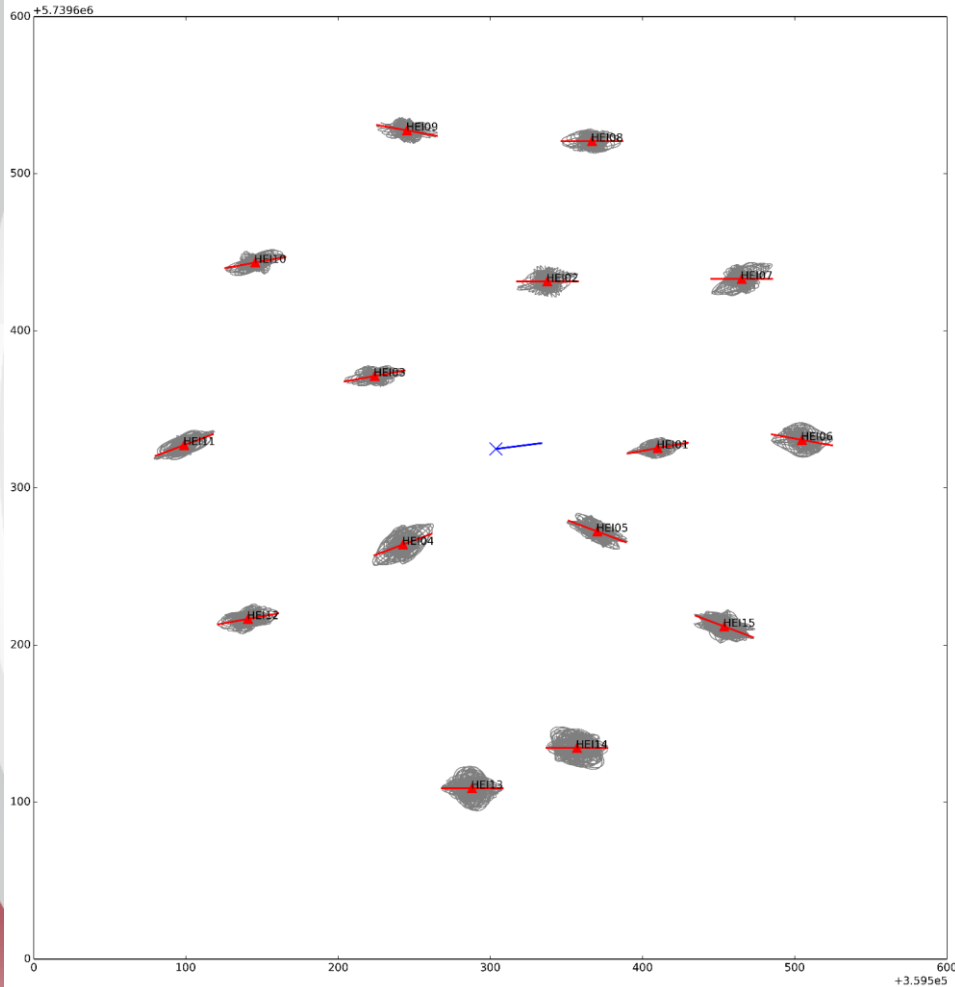
Wed Nov 21 21:00:00 2018
HEIWF
1.0 - 1.2 Hz



- Windgeschwindigkeit: 6.8 m/s
- Rotation: 10.51 U/min
- Leistung: 834 kW
- Windrichtung: 83° (E – W)
- BP Filter: 1.0 – 1.2 Hz

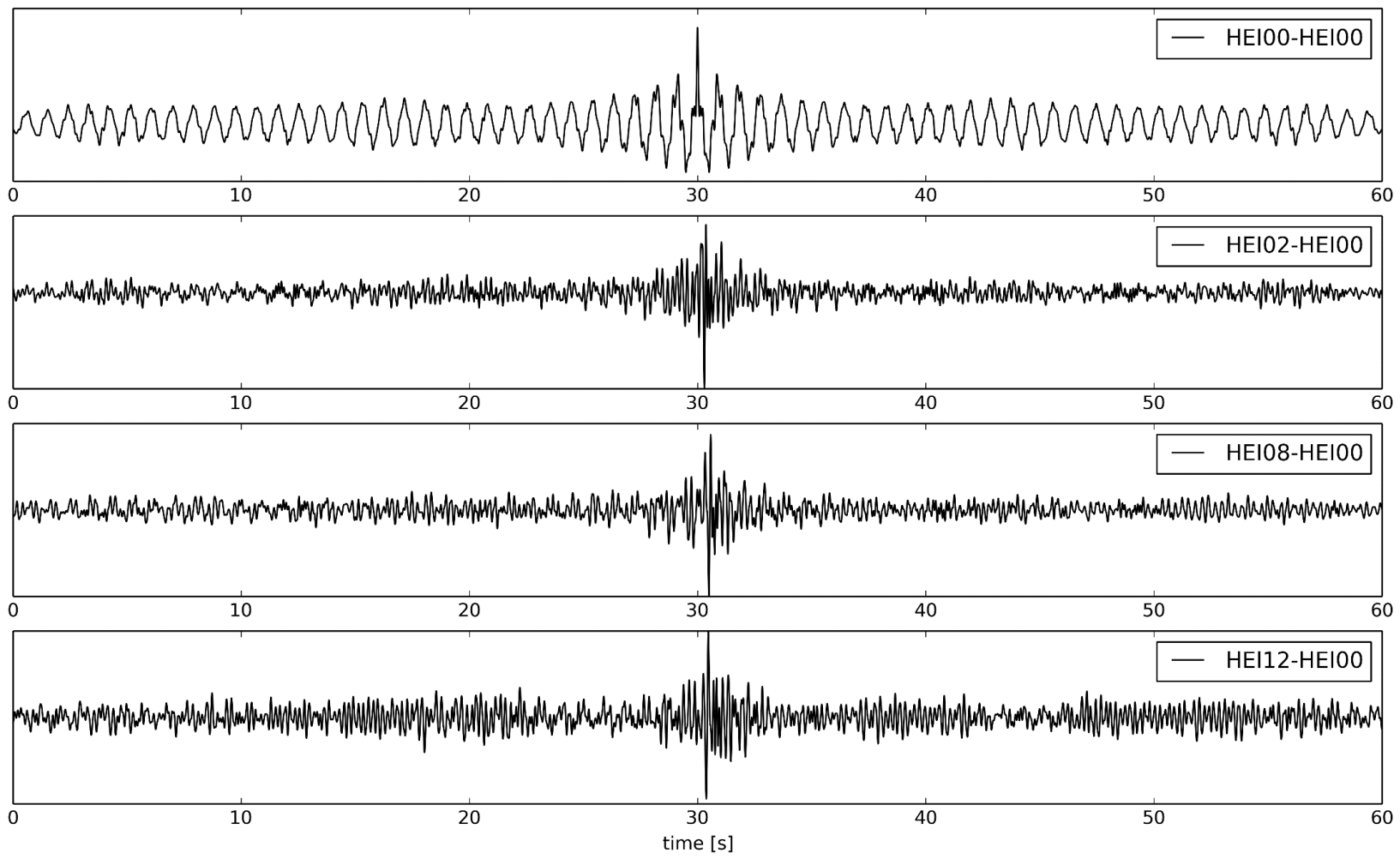
Particle motion

Wed Nov 21 21:00:00 2018
1.0 - 1.2 Hz

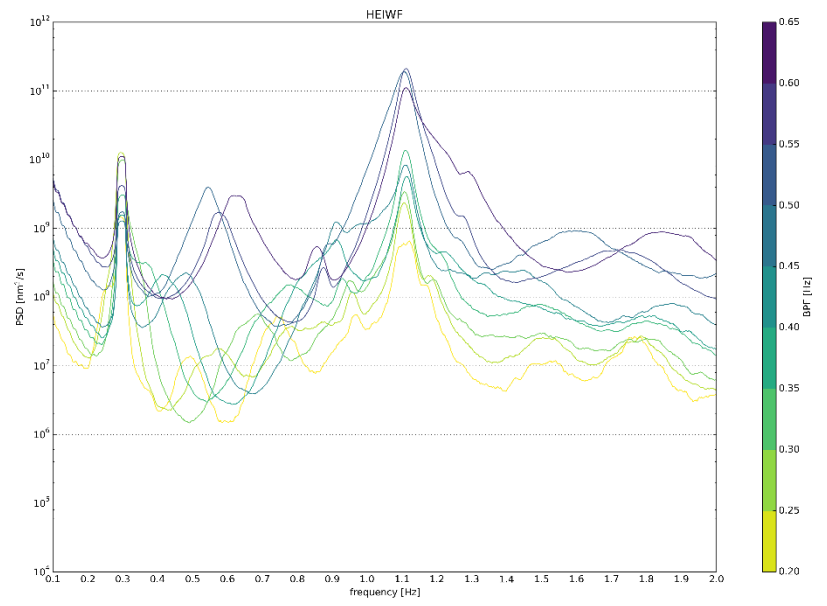
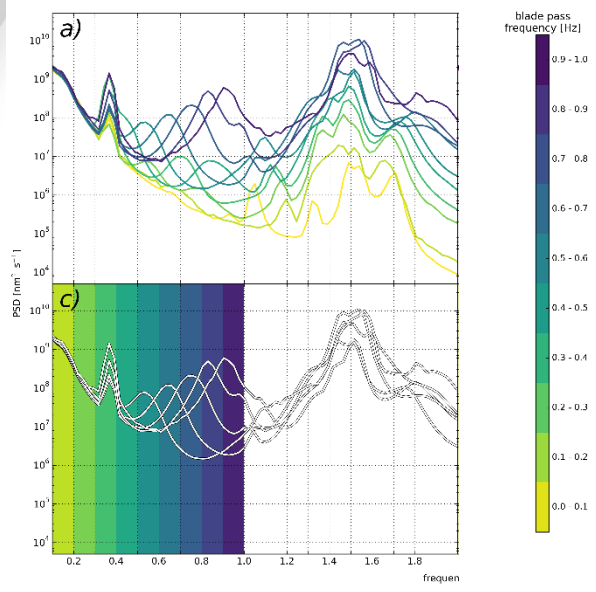


- Windgeschwindigkeit: 6.8 m/s
- Rotation: 10.51 U/min
- Leistung: 834 kW
- Windrichtung: 83° (E – W)
- BP Filter: 1.0 – 1.2 Hz

Wellenausbreitung



WEA Vergleich



- Enercon E-82
- Leistung: 2 MW
- Nabenhöhe: 138 m
- Rotordurchmesser: 82 m

- Enercon E-115
- Leistung: 3 MW
- Nabenhöhe: 149 m
- Rotordurchmesser: 115.7 m