Investigating Vibroseis Sweeps using 6 Rotational Sensors in Fürstenfeldbruck, Germany

Gizem Izgi [(1)], Eva P.S. Eibl [(1)], Frank Krüger [(1)], Felix Bernauer [(2)]

[1] Institute of Geosciences, University of Potsdam, Karl-Liebknecht-Str. 24/25, 14476 Potsdam, Germany

[2] Department für Geo- und Umweltwissenschaften, Ludwig-Maximilians Universität München, 80333 München, Germany

Contact: gizem.izgi@uni-potsdam.de

This presentation participates in OSPP

Outstanding Student & PhD candidate Presentation contest

Introduction

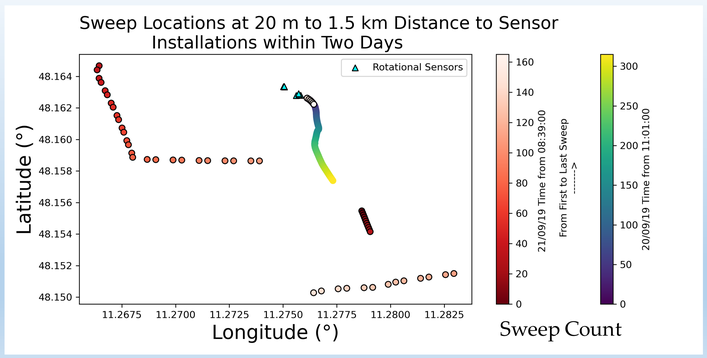
To further investigate and compare recently developed rotational sensors an experiment was made in Fürstenfeldbruck area. Within this scope, a vibroseis truck was operated starting from 20 November 2019, 11:00 UTC until 21 November 2019, 14:00 UTC. We recorded 480 Sweep signals in a broad frequency range between 7 to 120 Hz at 160 different locations. Each sweep lasted 15 seconds.

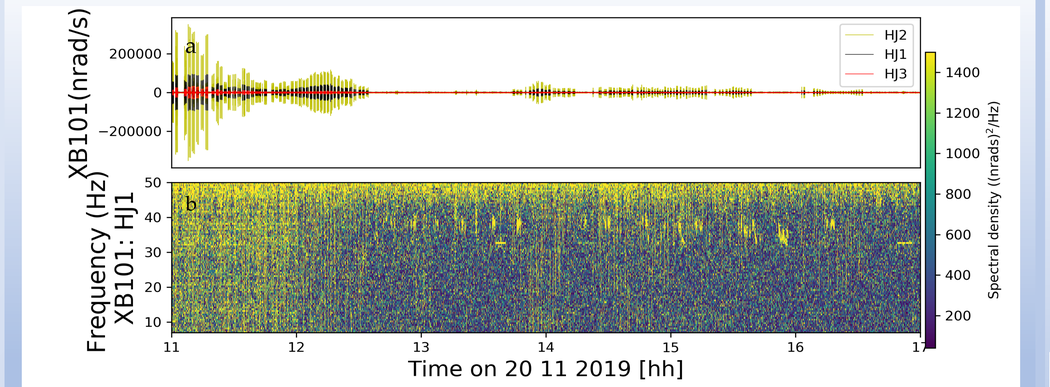
The Sensor & The Source

Thomas, VIB 3246

blueSeis-3A (exail)

The Field





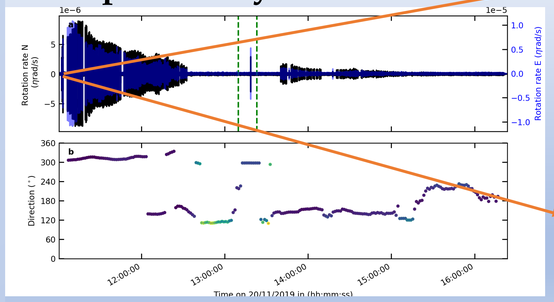
(a) Waveforms East (HJ1), North (HJ2) and vertical (HJ3) components (black, yellow & red) and (b) Spectrogram of East component of the XB101

Method

Back azimuth estimation using only rotational sensor (Wassermann et al. 2016, Wassermann et al. 2020):

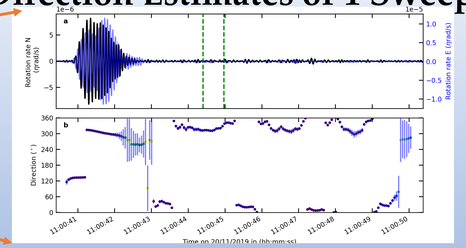
- Orthogonal distance regression sensitive to SV-type or Rayleigh waves
- Direction estimations using only the horizontal rotational components

Direction Estimates of All Sweeps in 1 day



Theo. direction between 314.54° & 345.52°

Direction Estimates of 1 Sweep

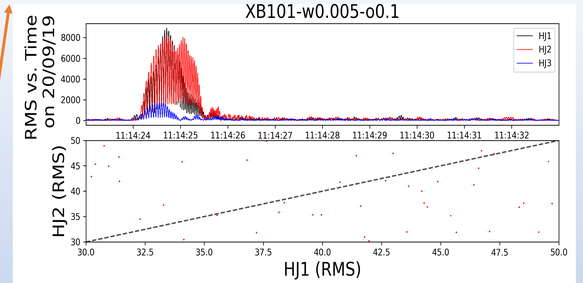


Theo. direction: 315.23°

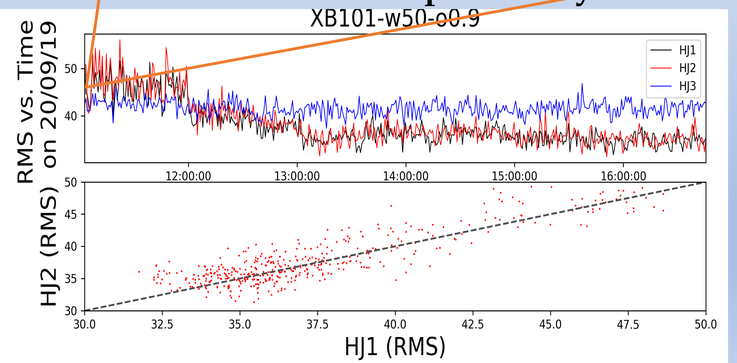
fmin=7 Hz, fmax=15 Hz
90% overlap

RMS of 1 Sweep

Theo. direction: 315.23°



RMS of All Sweeps in 1 day



Results

- Direction estimates of vibroseis sweeps using only horizontal components of a rotational sensor are accurate.
- RMS decreases with time for horizontal components and Vertical component is mostly stable convenient for sweep locations.

Future Work

- Investigating each sweep via polarization analysis to check SH and SV wave types.
- Estimating the locations of each sweep via 8 rotational sensors.