The COSO Microseismic Survey using the Fiber Optic Seismic Vector Sensor (FOSVS) System

Paulsson Inc. (PI)
April 24, 2017

The Coso Microseismic Survey

- Survey Date: March 13 – 21, 2017
- Data Recording: March 14 – 20, 2017
- VSP Well: 83-11
- Lease: Naval Air Weapons Station China Lake
- Seismic Sensors: 12-Level 3C FOSVS
- Recording System: TDI sampling @ 48,076.92 Hz
- Deployment Depth: MD 1525 – 1800 ft @ 25 ft interval

The West Flank FORGE Site

Maps from FORGE Phase 1 West Flank of Coso, CA

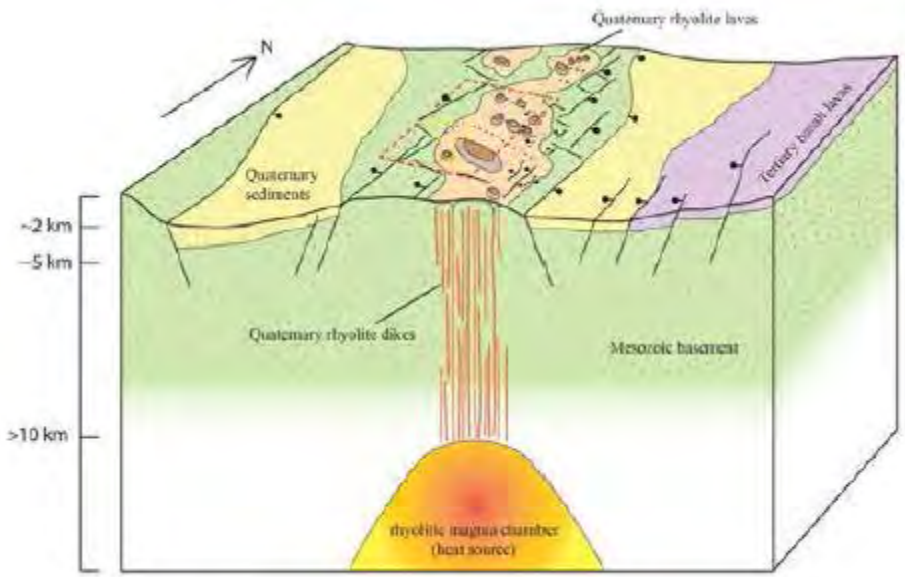
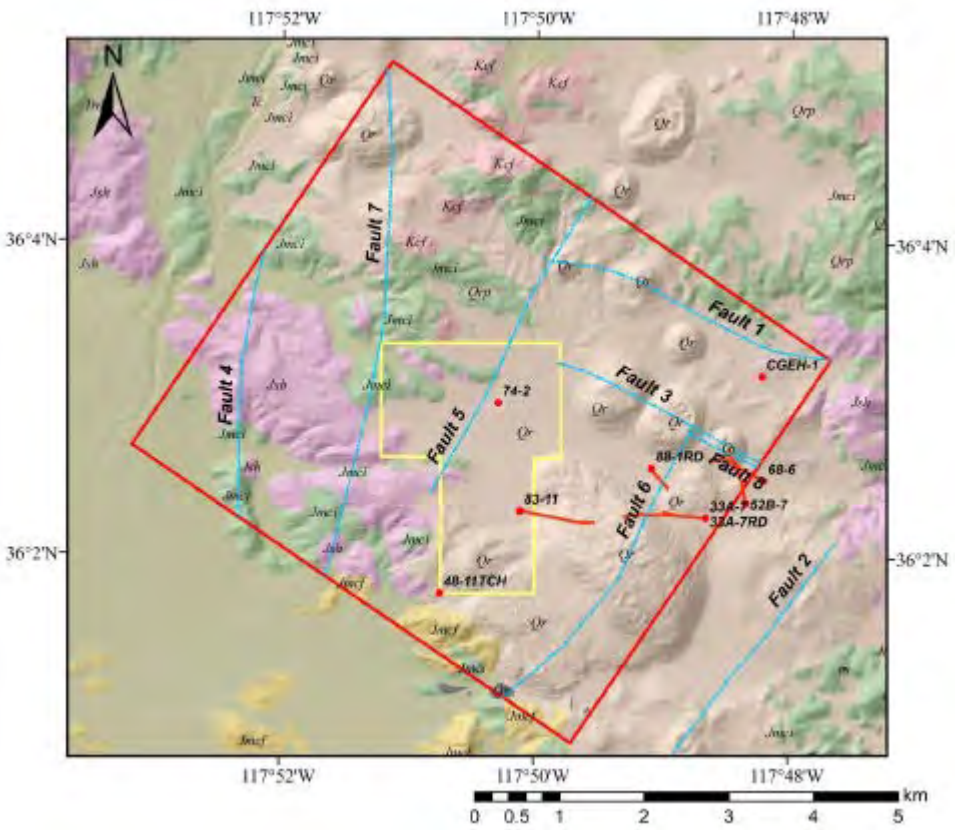


Figure 7. Schematic 3D model of the West Flank FORGE area.



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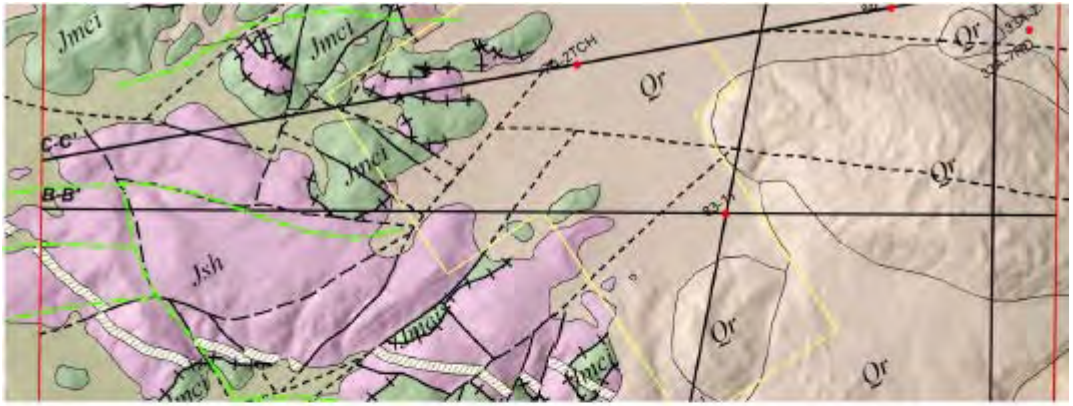
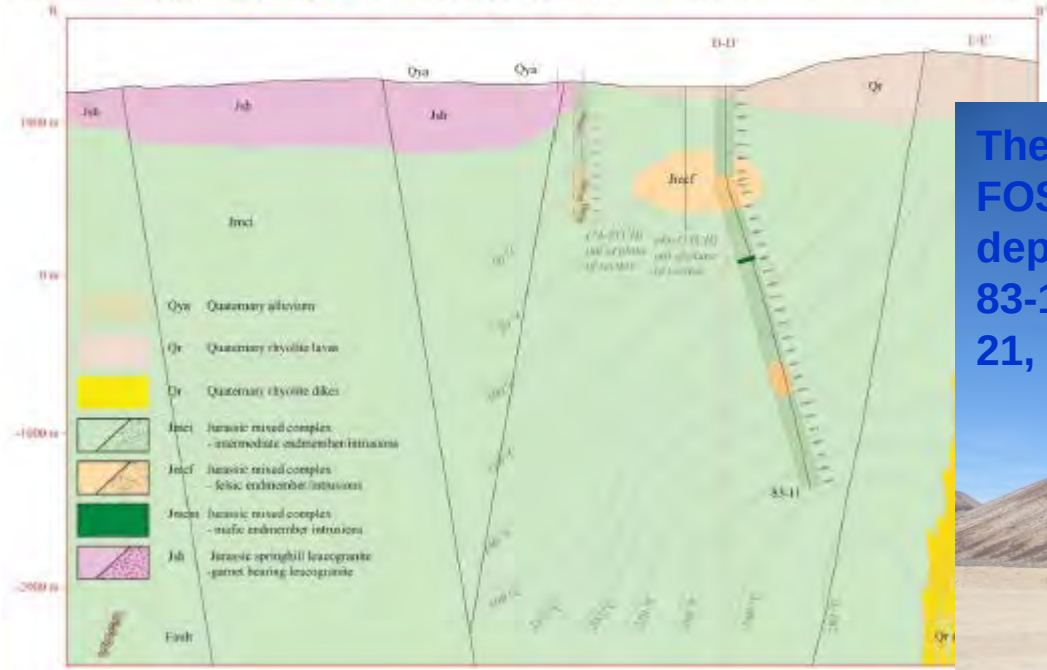
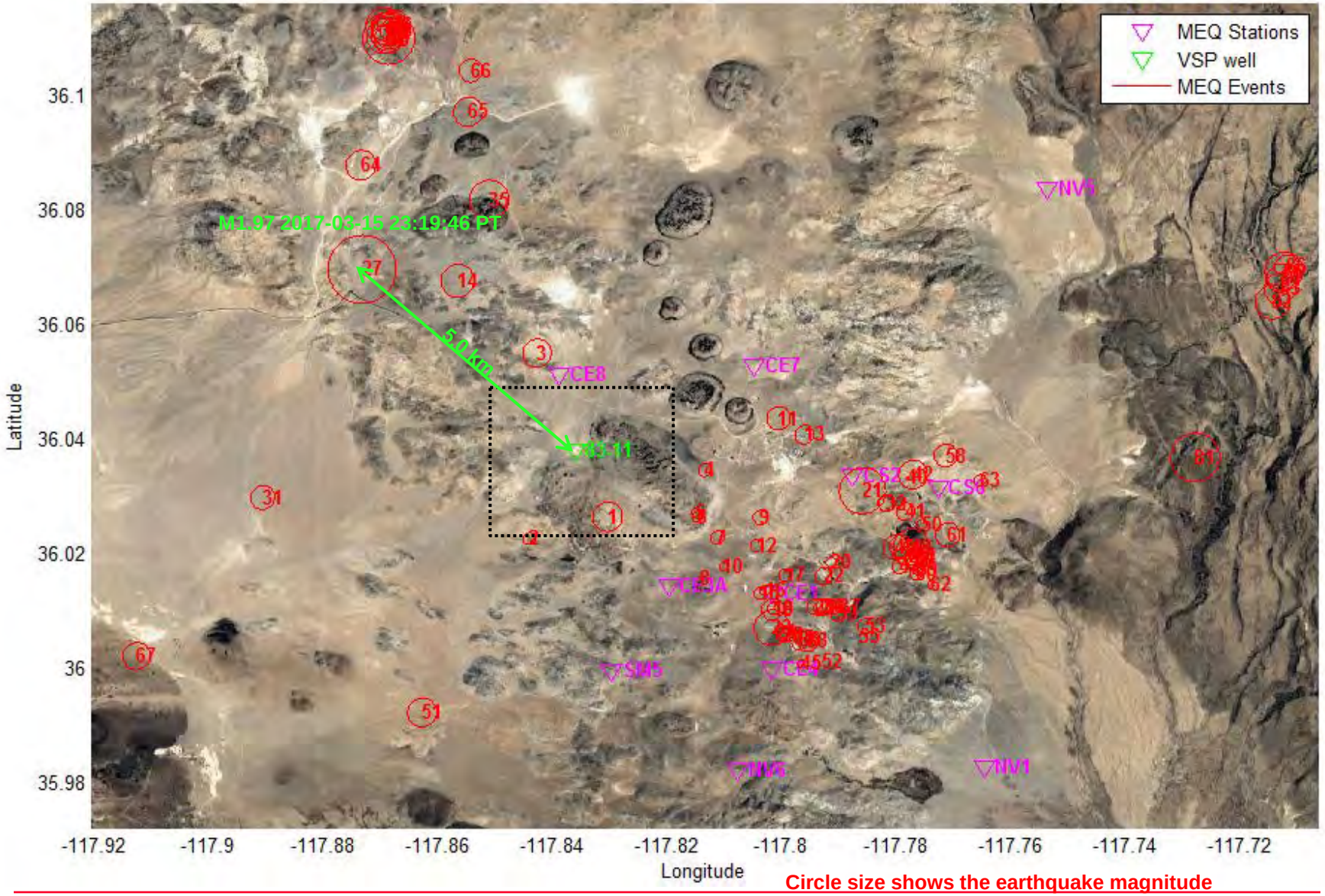
Maps from FORGE Phase 1 West Flank of Coso, CA





The Paulsson FOSVS system deployed into well 83-11 on March 13-21, 2017

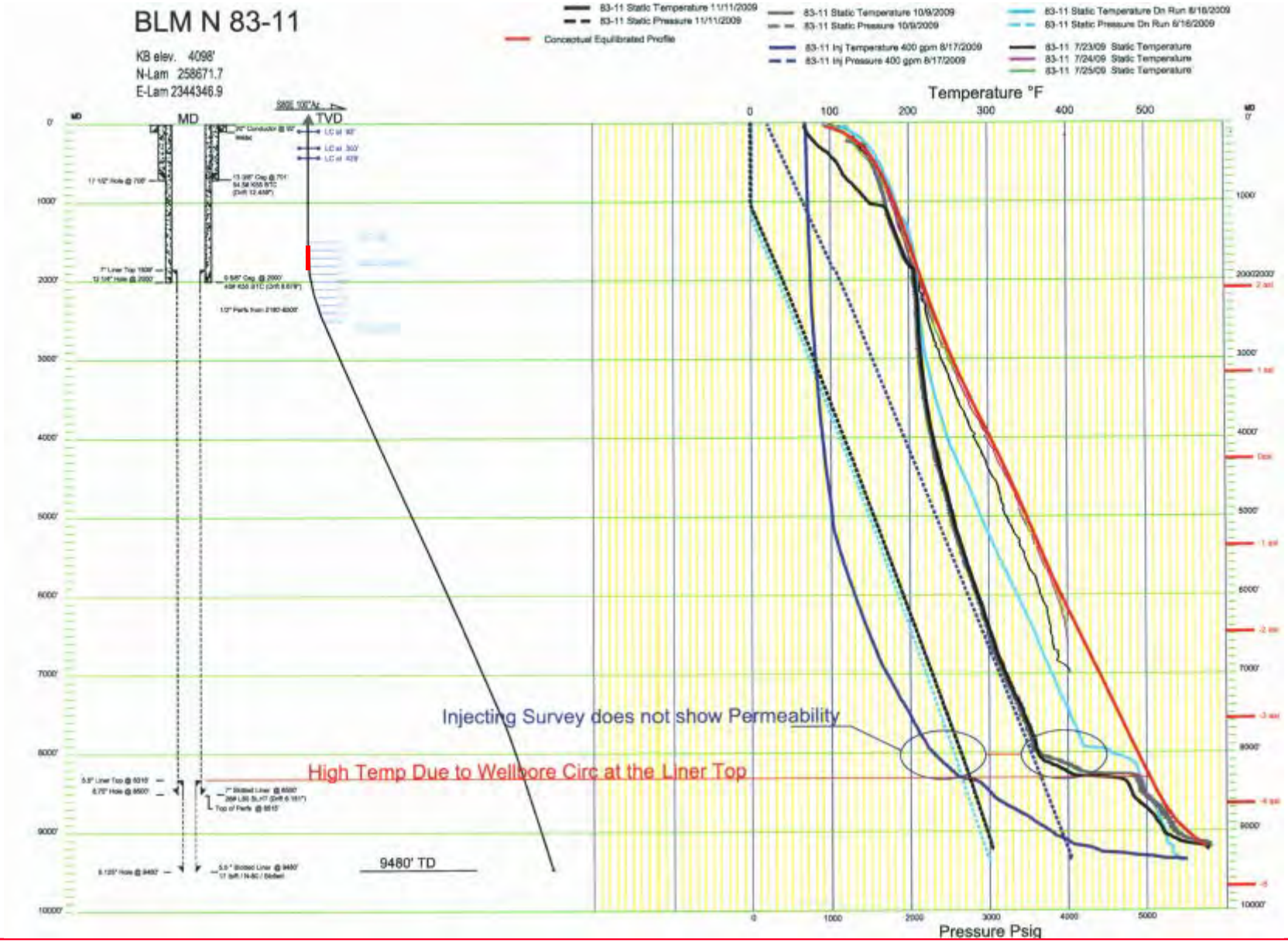
Events Located by MEQ Stations



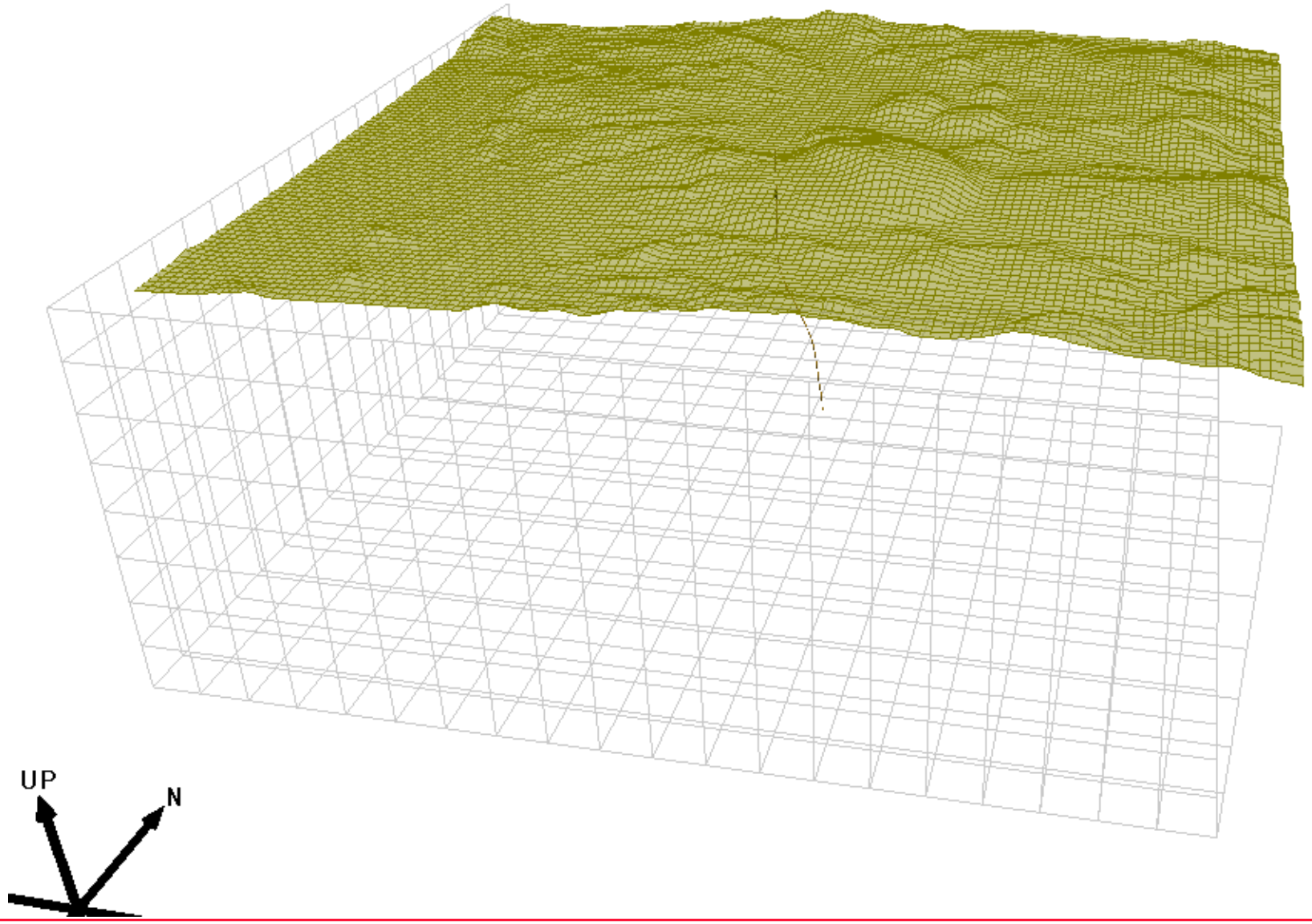
Circle size shows the earthquake magnitude
Number is the closeness order to well 83-11

Zoomed in Survey Area

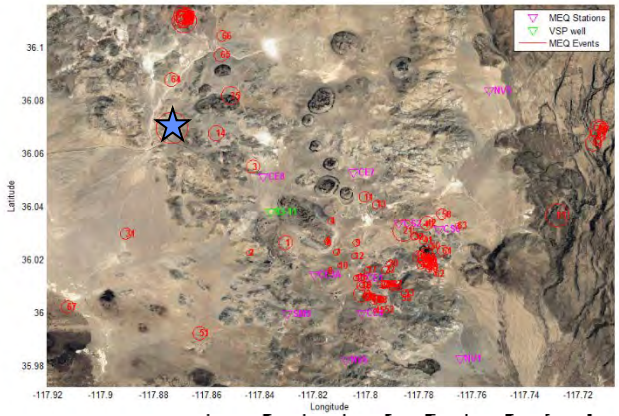
Well 83-11



Model



An Earthquake 5.0 km Away M1.97 Depth 3.8 km



PT: 2017-03-15 23:19:46

Filter: 5-10-200-300 Hz

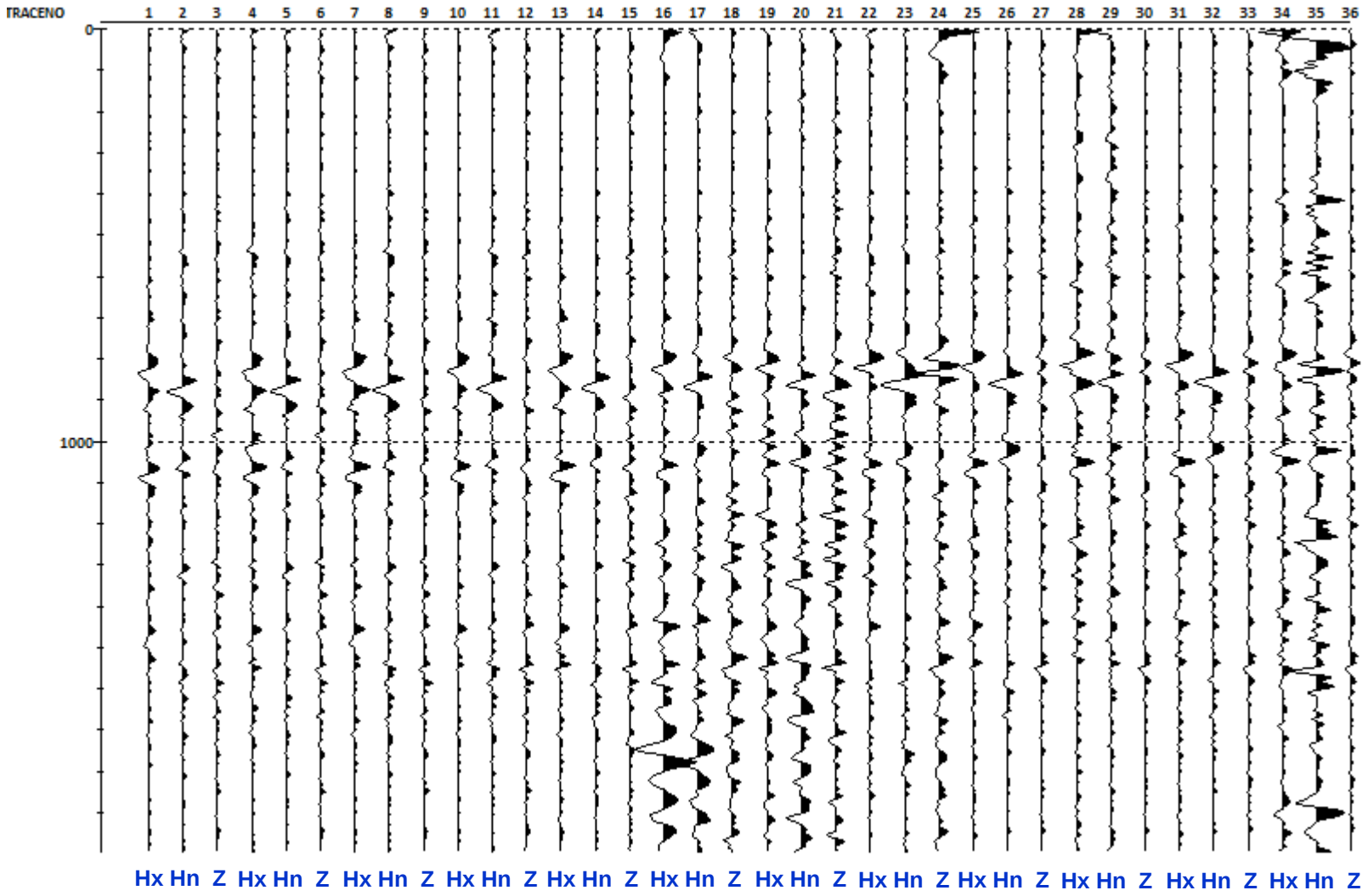
H1 H2 are unknown perpendicular horizontal directions; Z is the axial direction which is nearly vertical in this case.

An Earthquake 5.0 km Away M1.97 Depth 3.8 km

2C Rotated

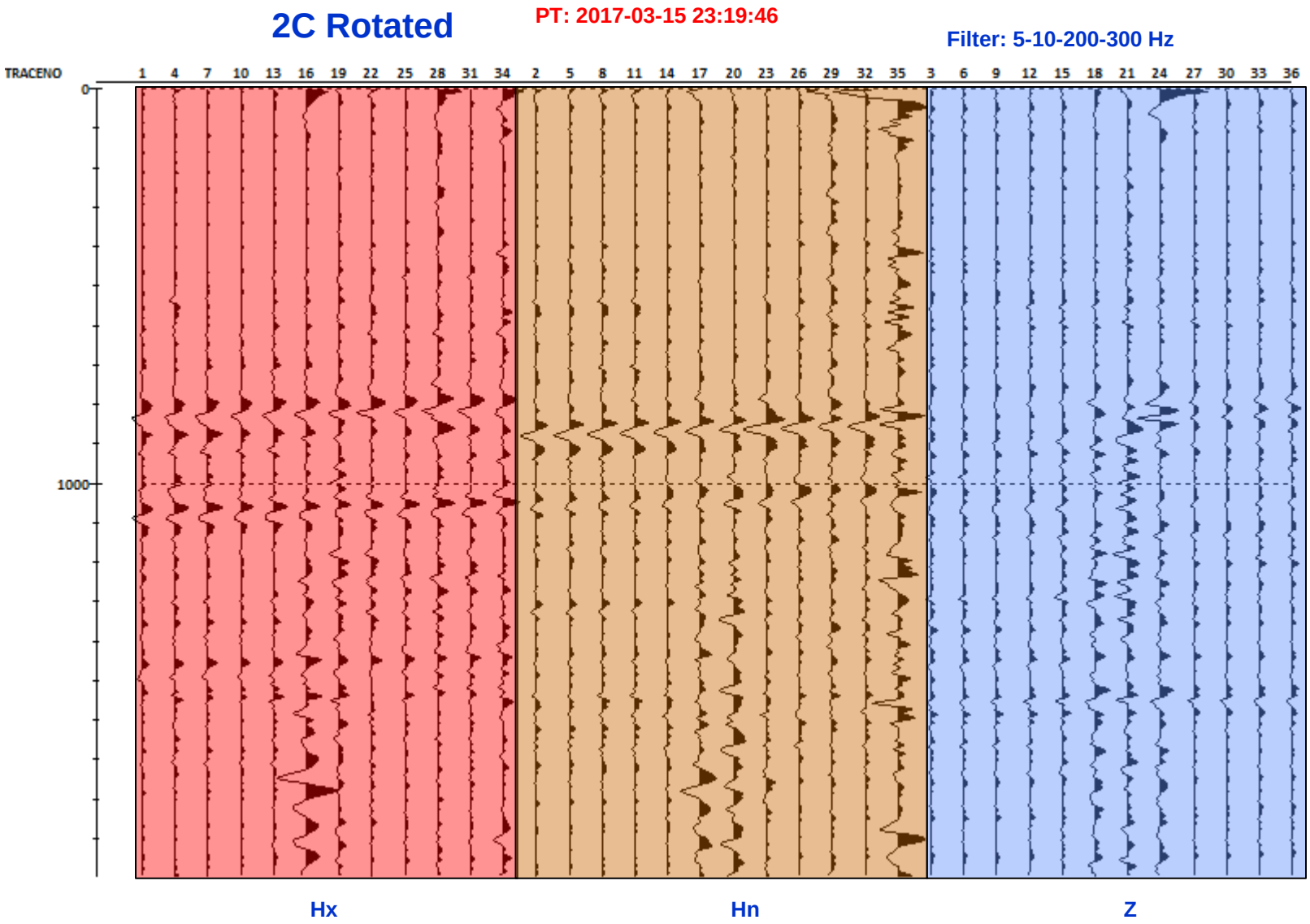
PT: 2017-03-15 23:19:46

Filter: 5-10-200-300 Hz



Hx/Hn is the horizontal direction which has the maximum/minimum energy at the first break.

An Earthquake 5.0 km Away M1.97 Depth 3.8 km



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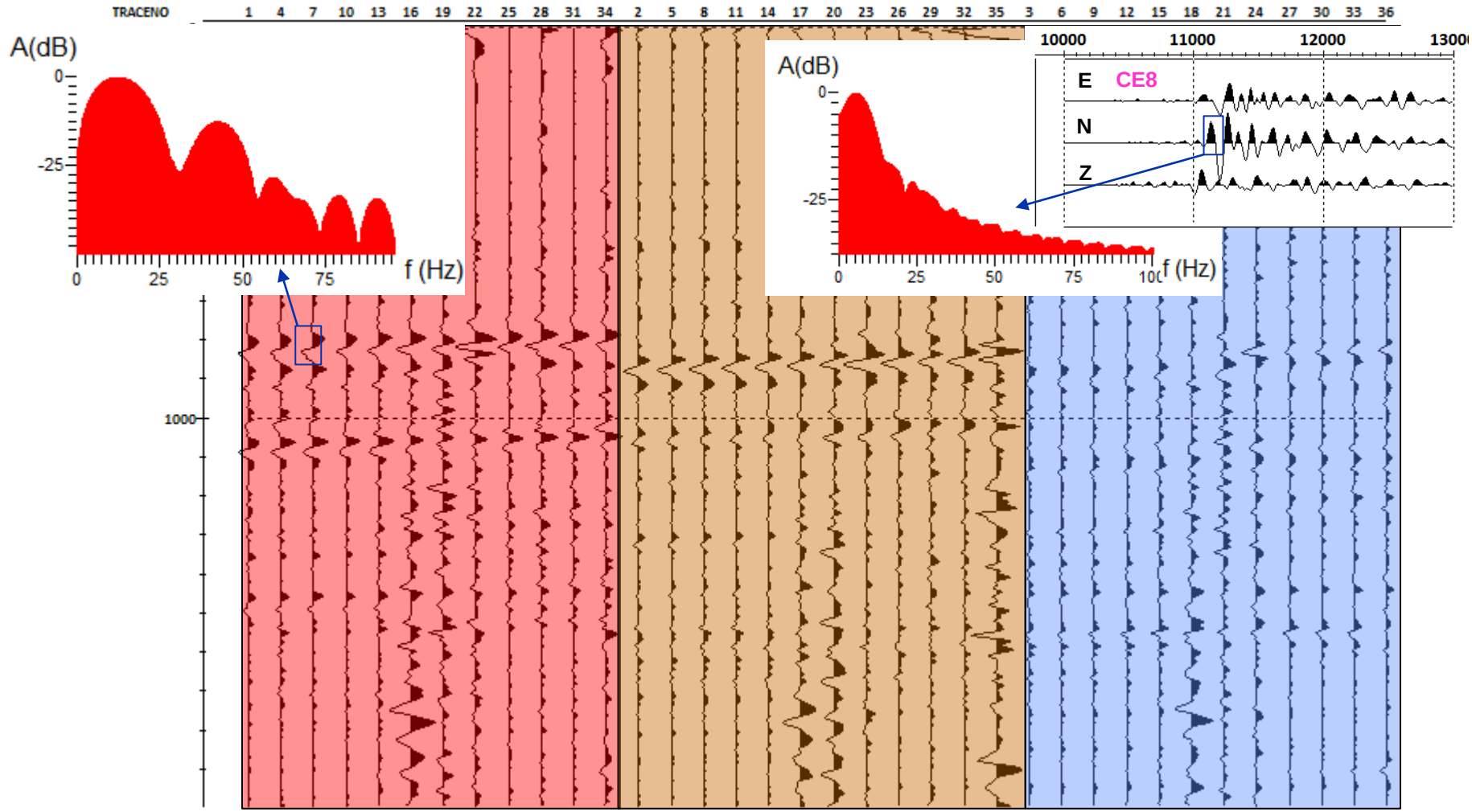
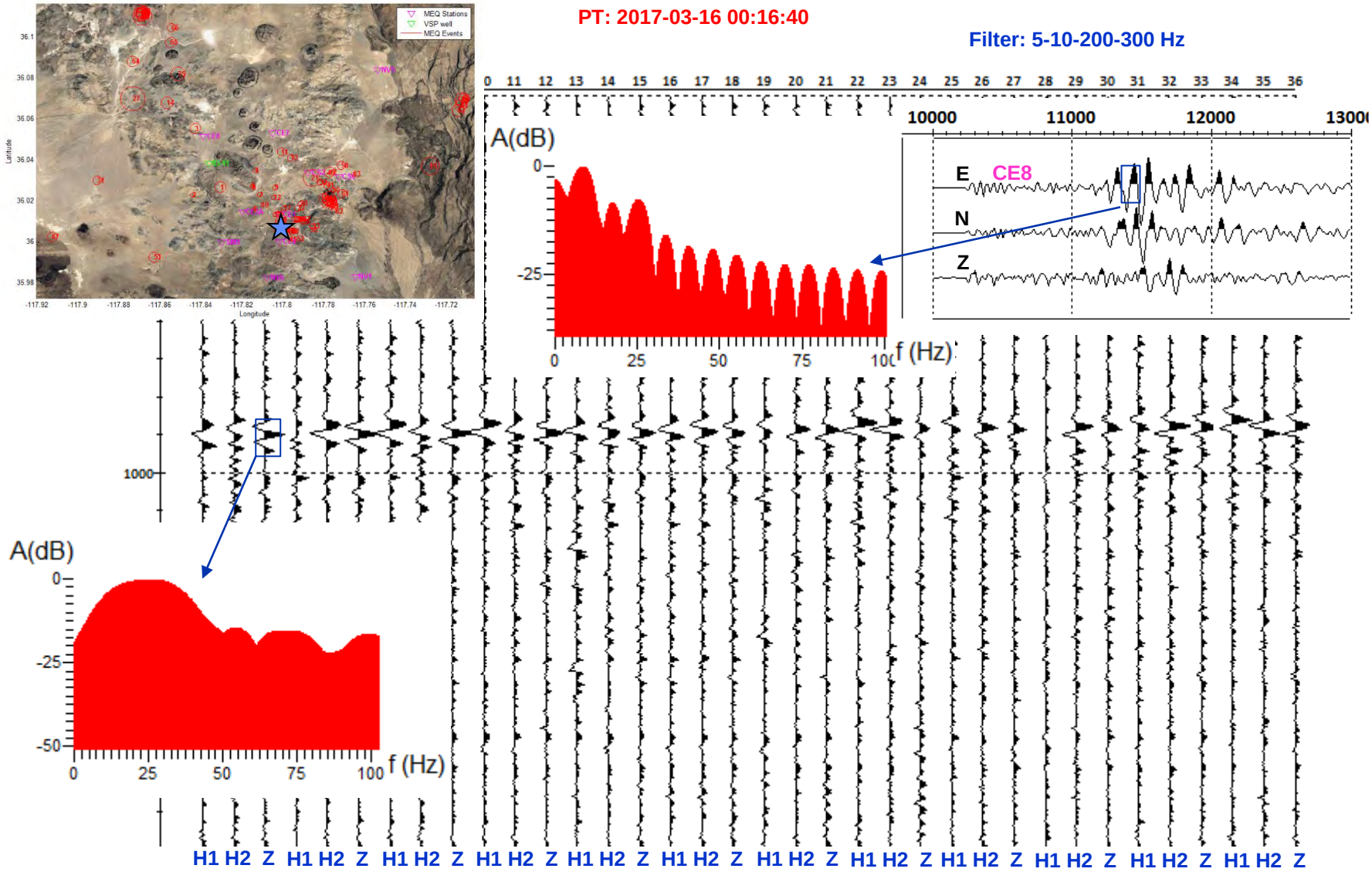
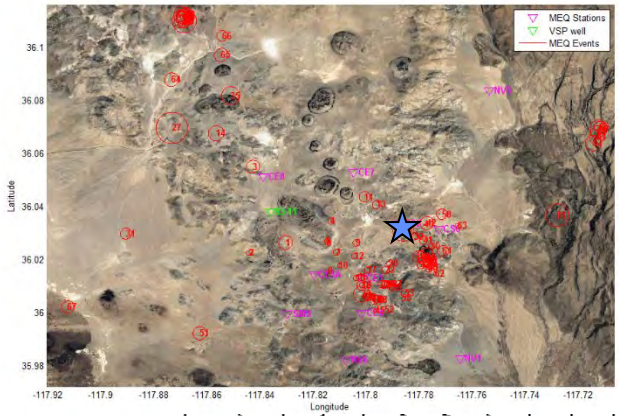


P is the primary energy direction; R is the radial minimum energy direction; T is the transverse direction

An Earthquake 4.4 km Away M0.53 Depth 2.1 km



An Earthquake 4.7 km Away M1.02 Depth 3.7 km



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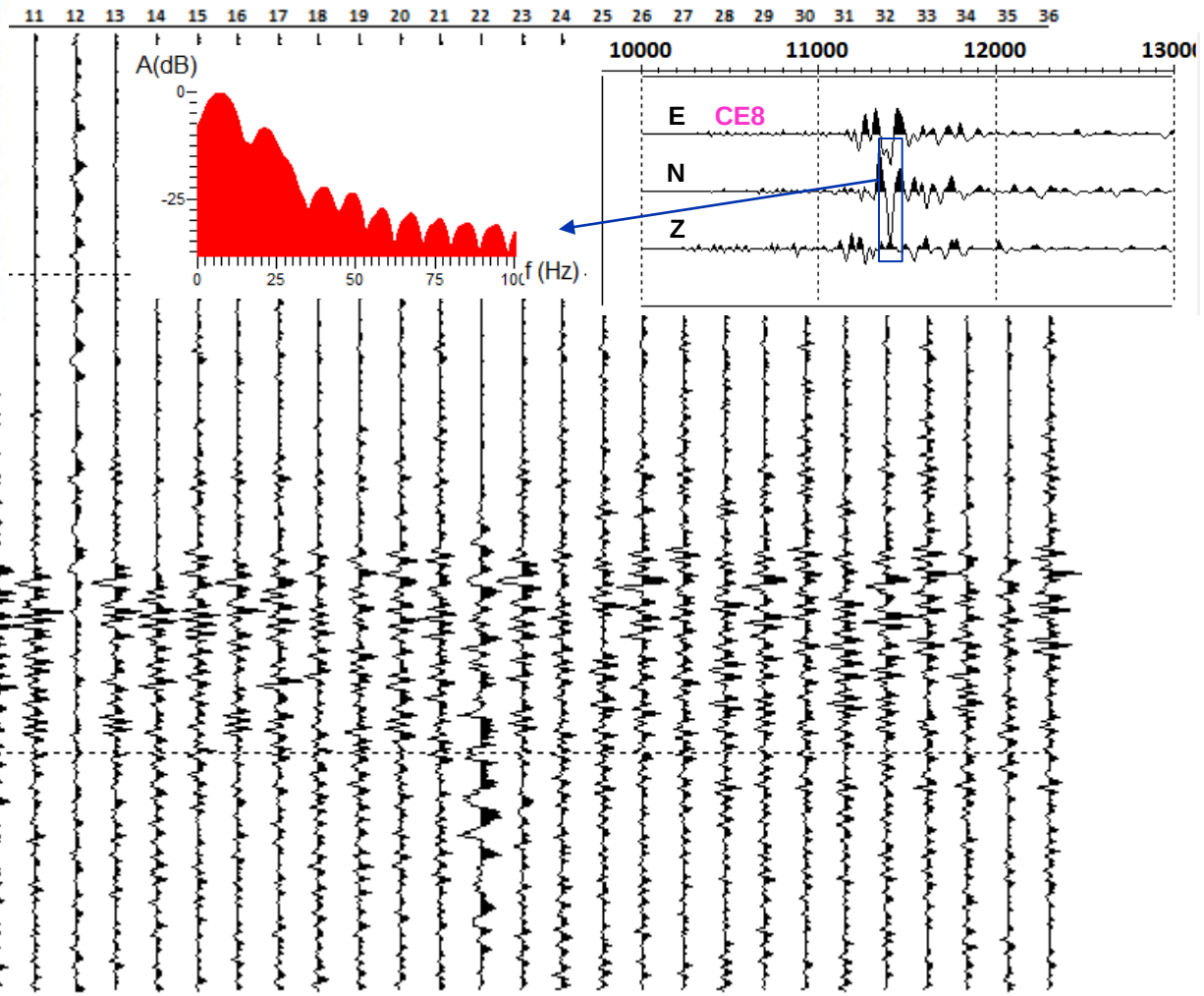
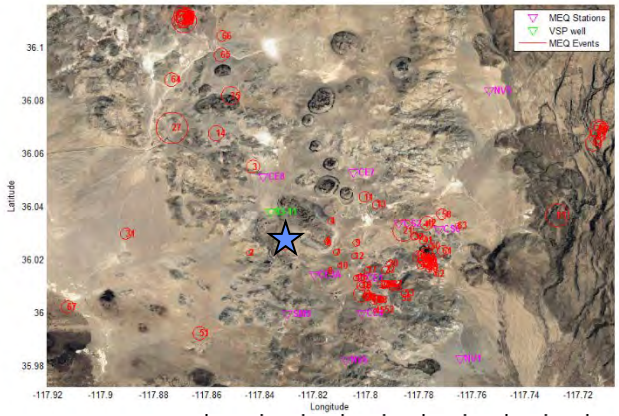
Filter: 5-10-200-300 Hz



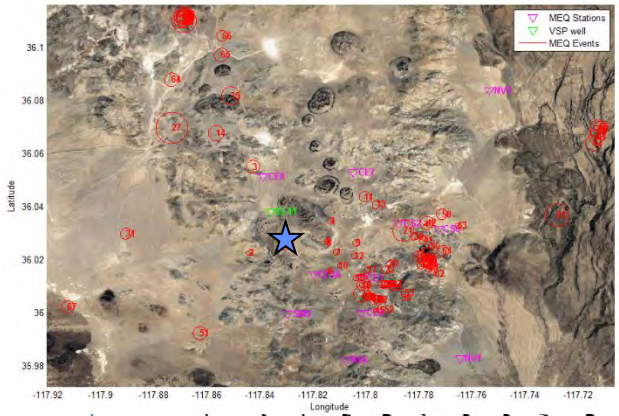
An Earthquake 1.1 km Away M0.29 Depth 03.5 km



PT: 2017-03-16 04:25:09

Filter: 5-10-200-300 Hz

An Earthquake 1.1 km Away M0.29 Depth 03.5 km



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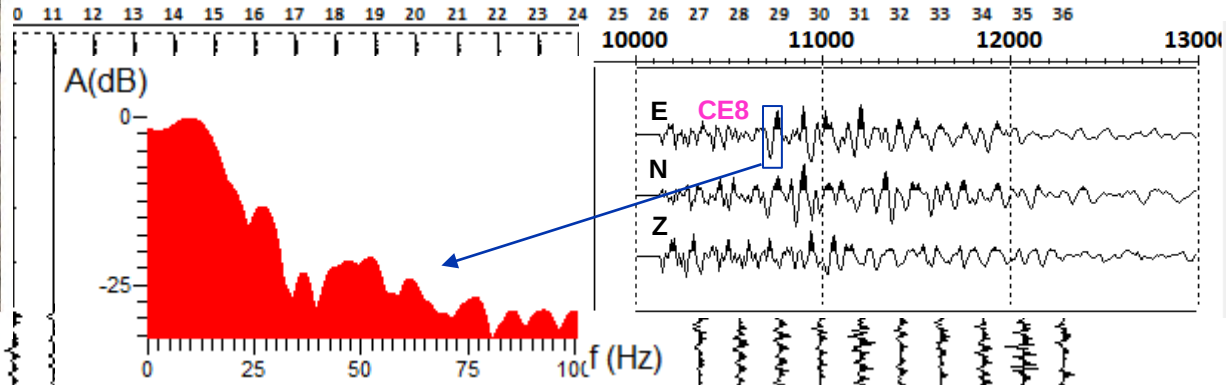
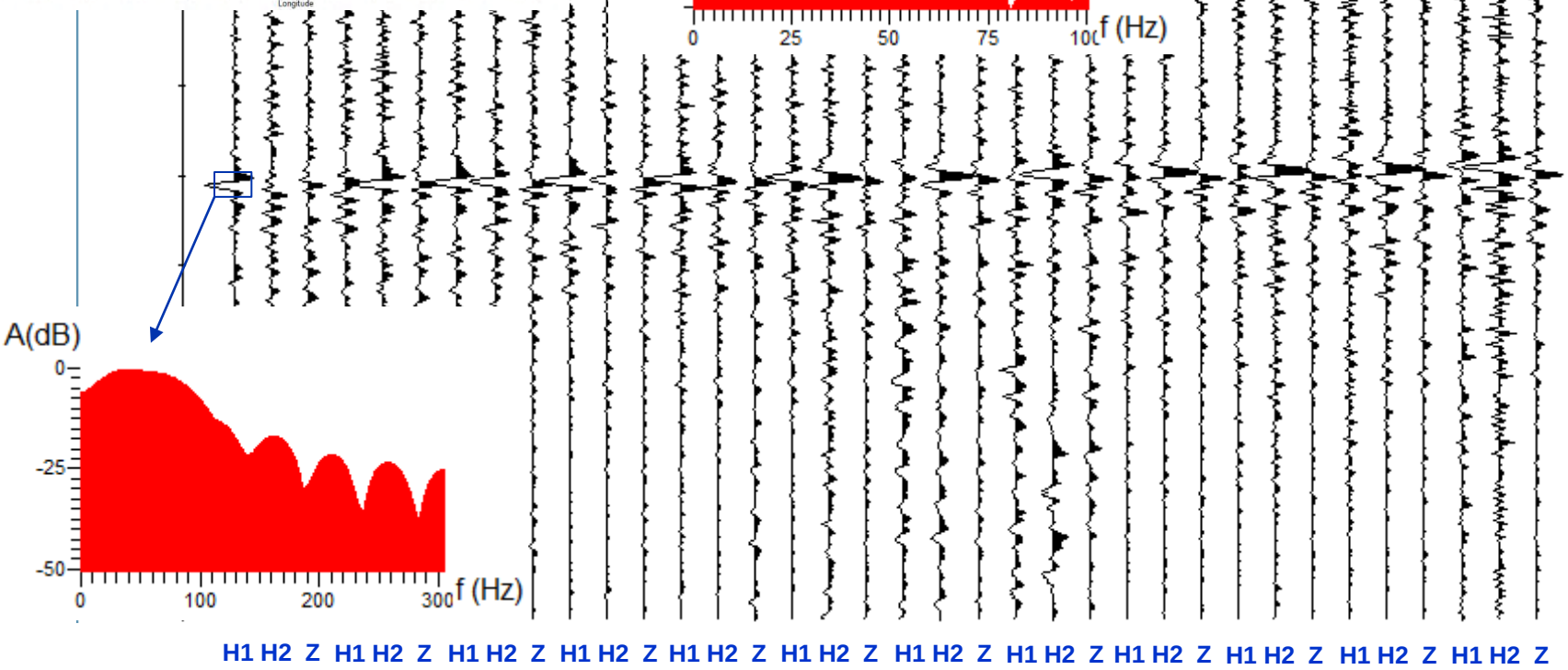
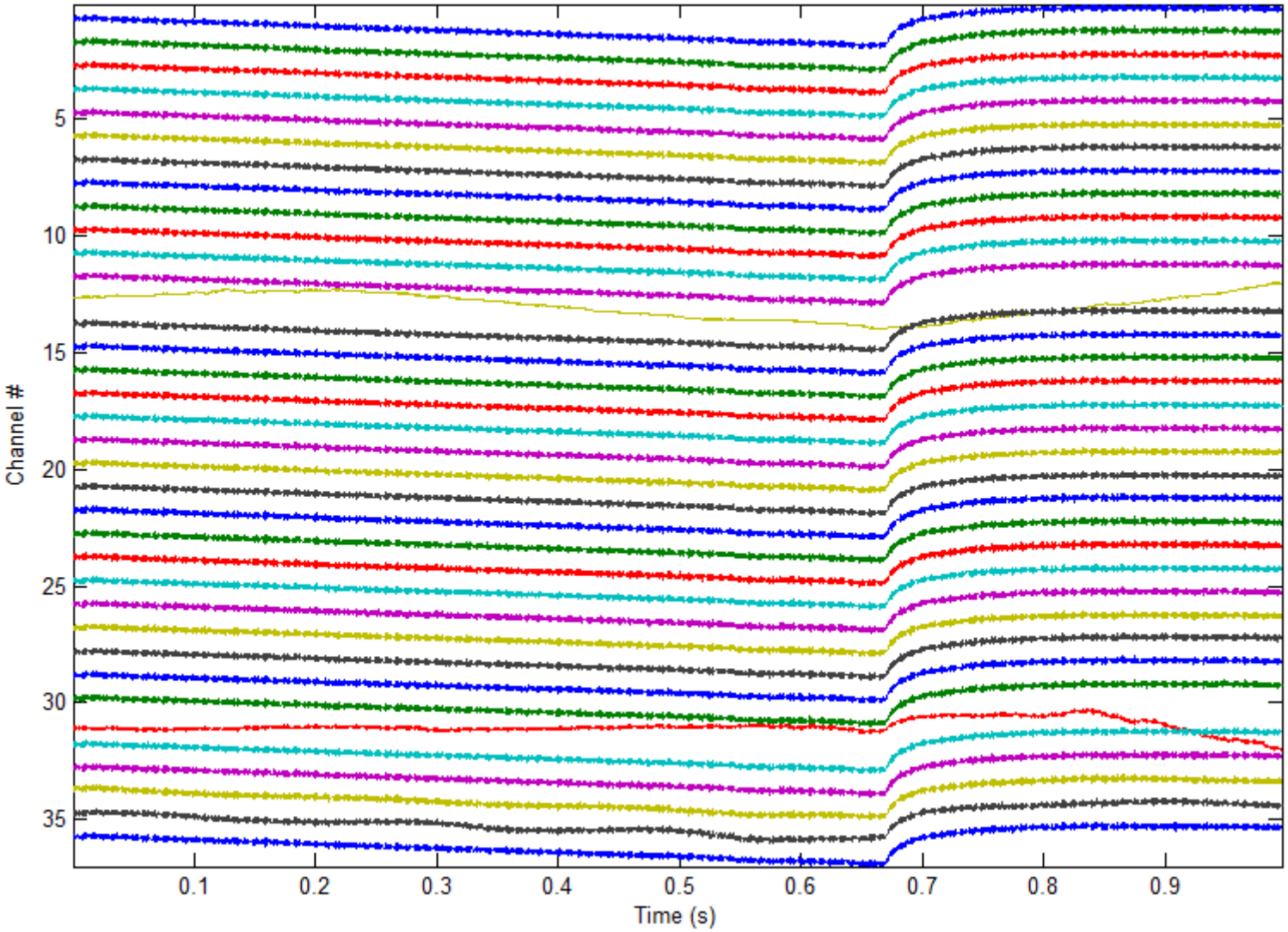
Filter: 5-10-200-300 Hz





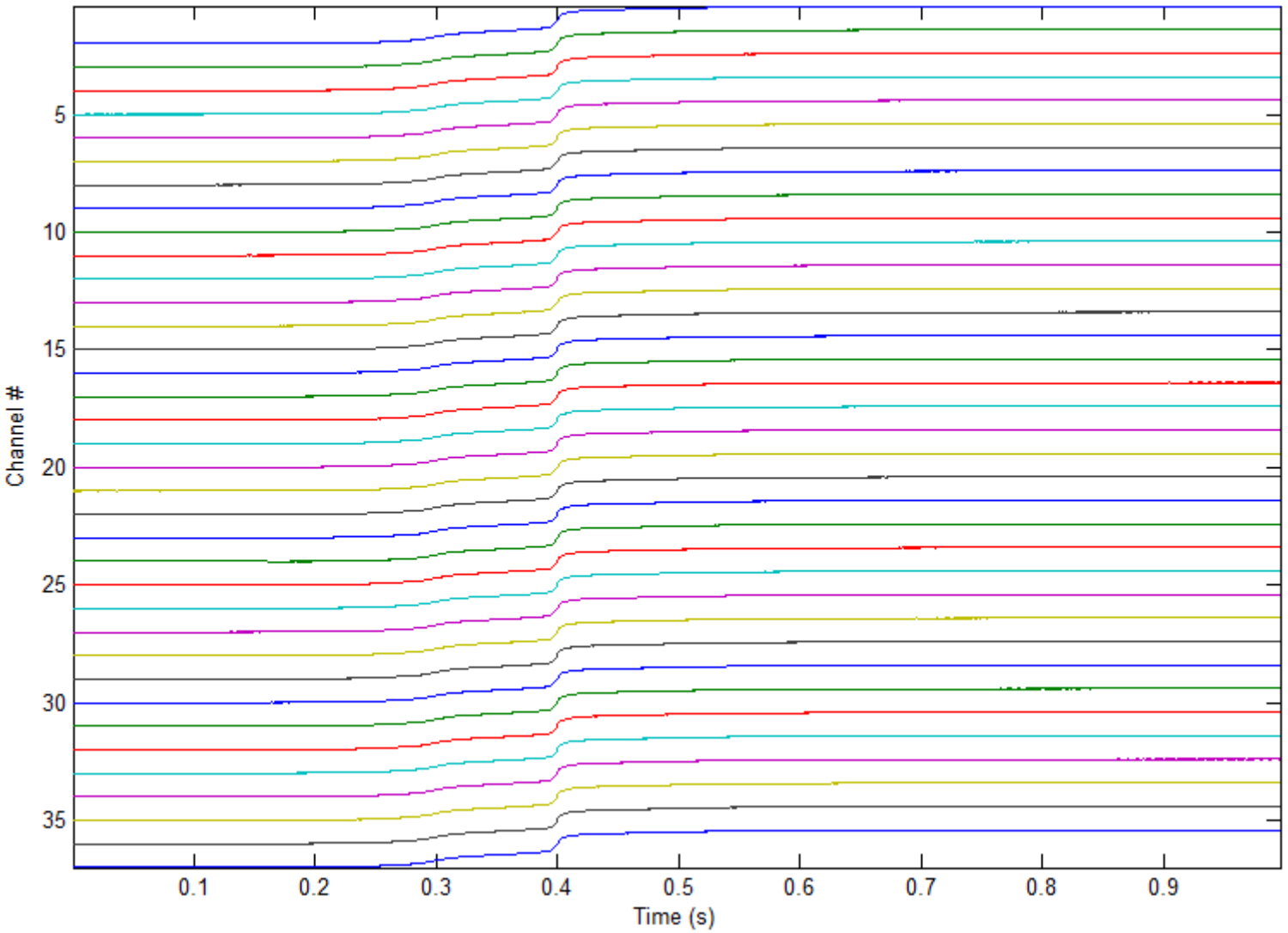
Abnormal Event That May Be Associated with Blowdown

PT: 2017-03-17 06:59:42



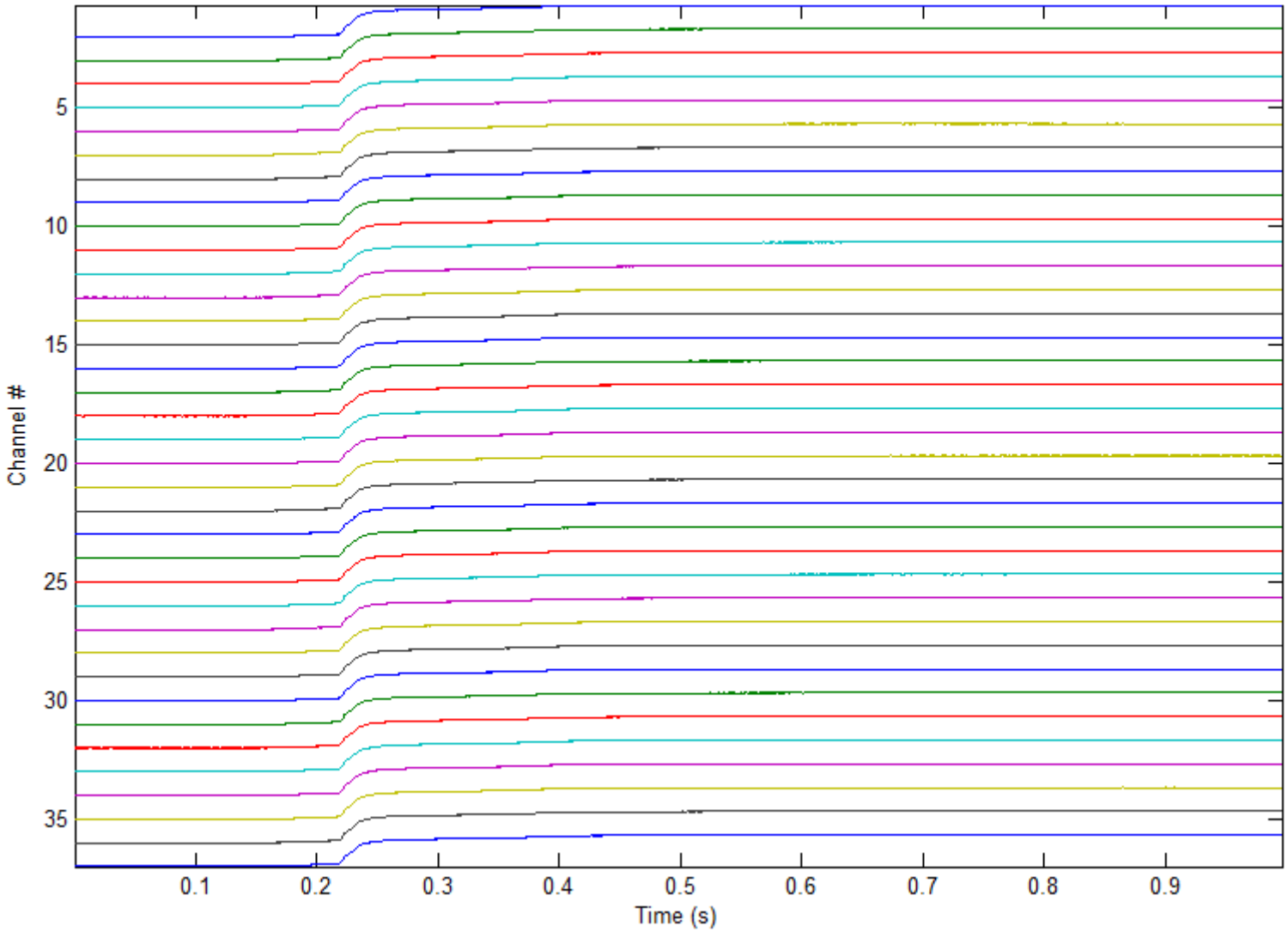
Abnormal Event That May Be Associated with Blowdown

PT: 2017-03-17 10:21:01



Abnormal Event That May Be Associated with Blowdown

PT: 2017-03-17 10:38:32



Abnormal Event That May Be Associated with Blowdown

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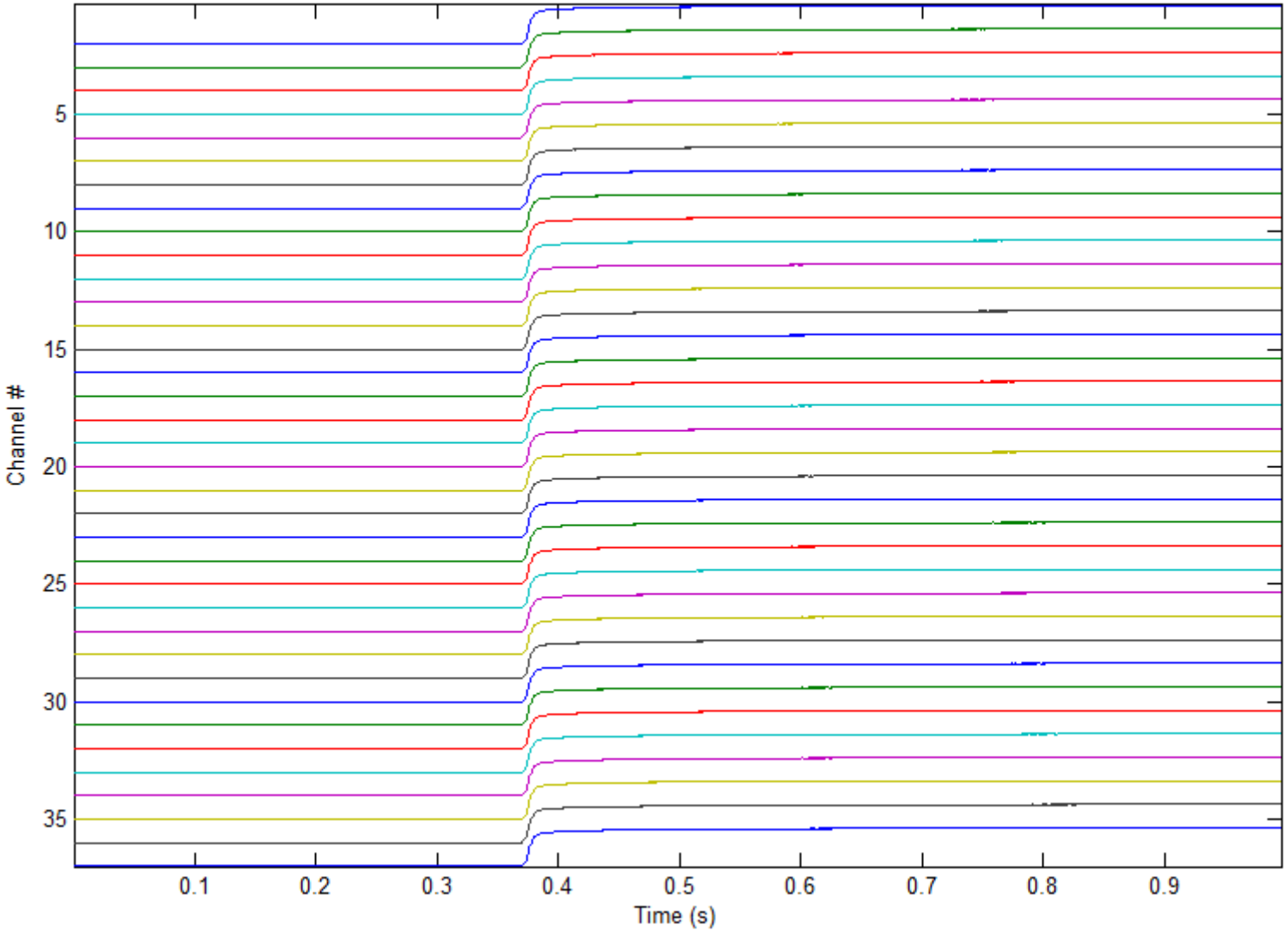
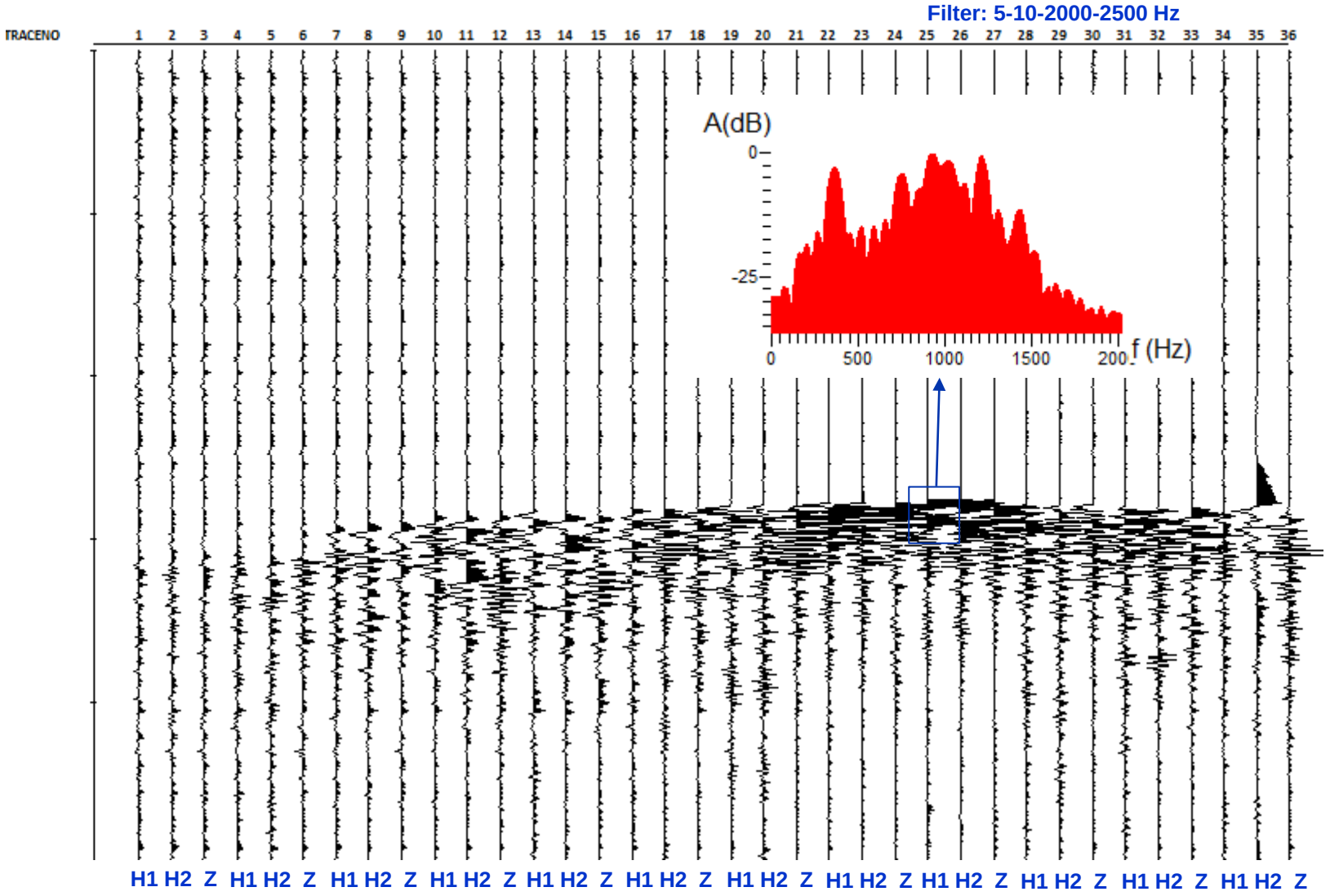


A Microseismic Event



Tap Test

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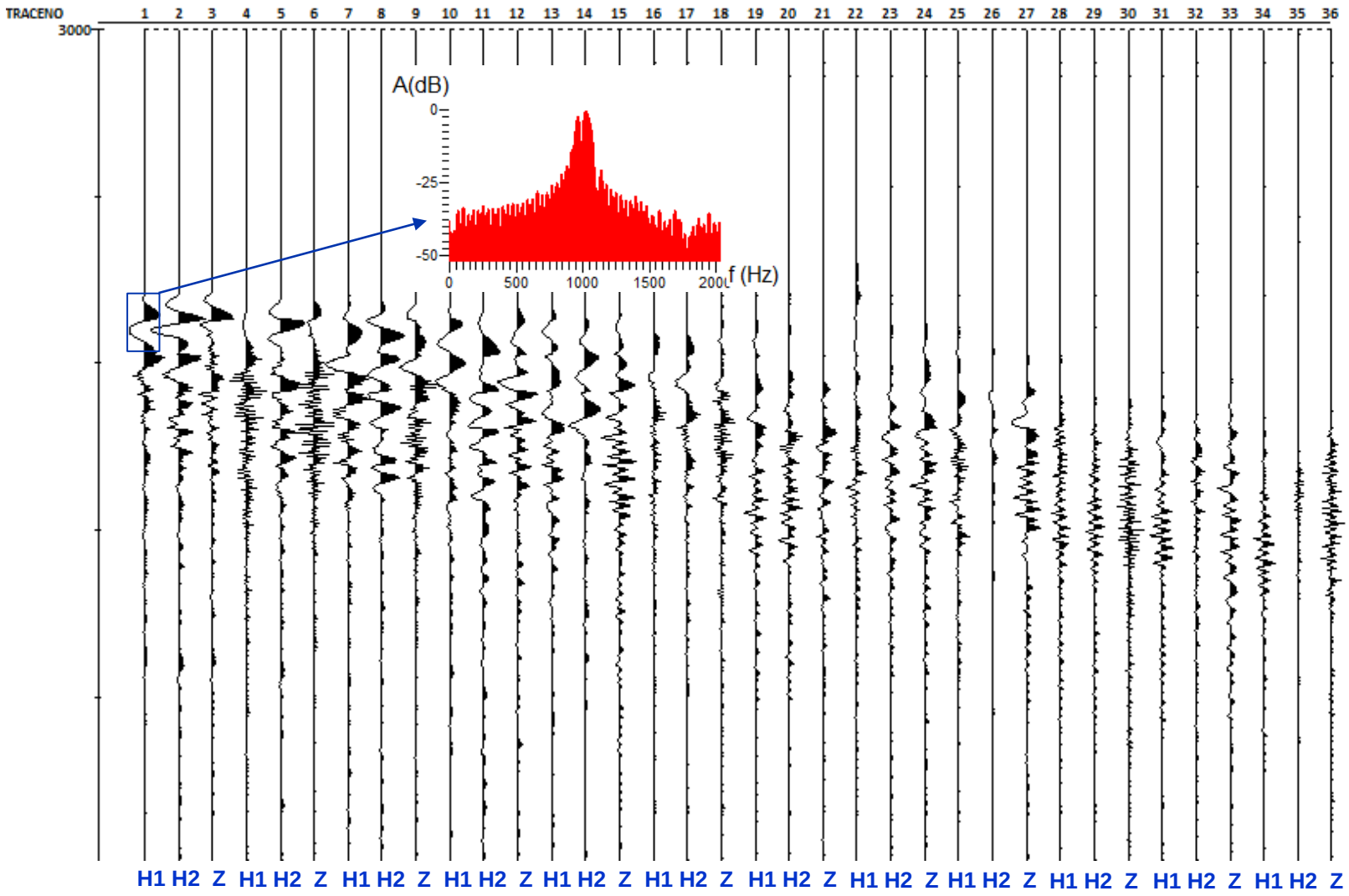
Filter: 5-10-2000-2500 Hz



Tap Test

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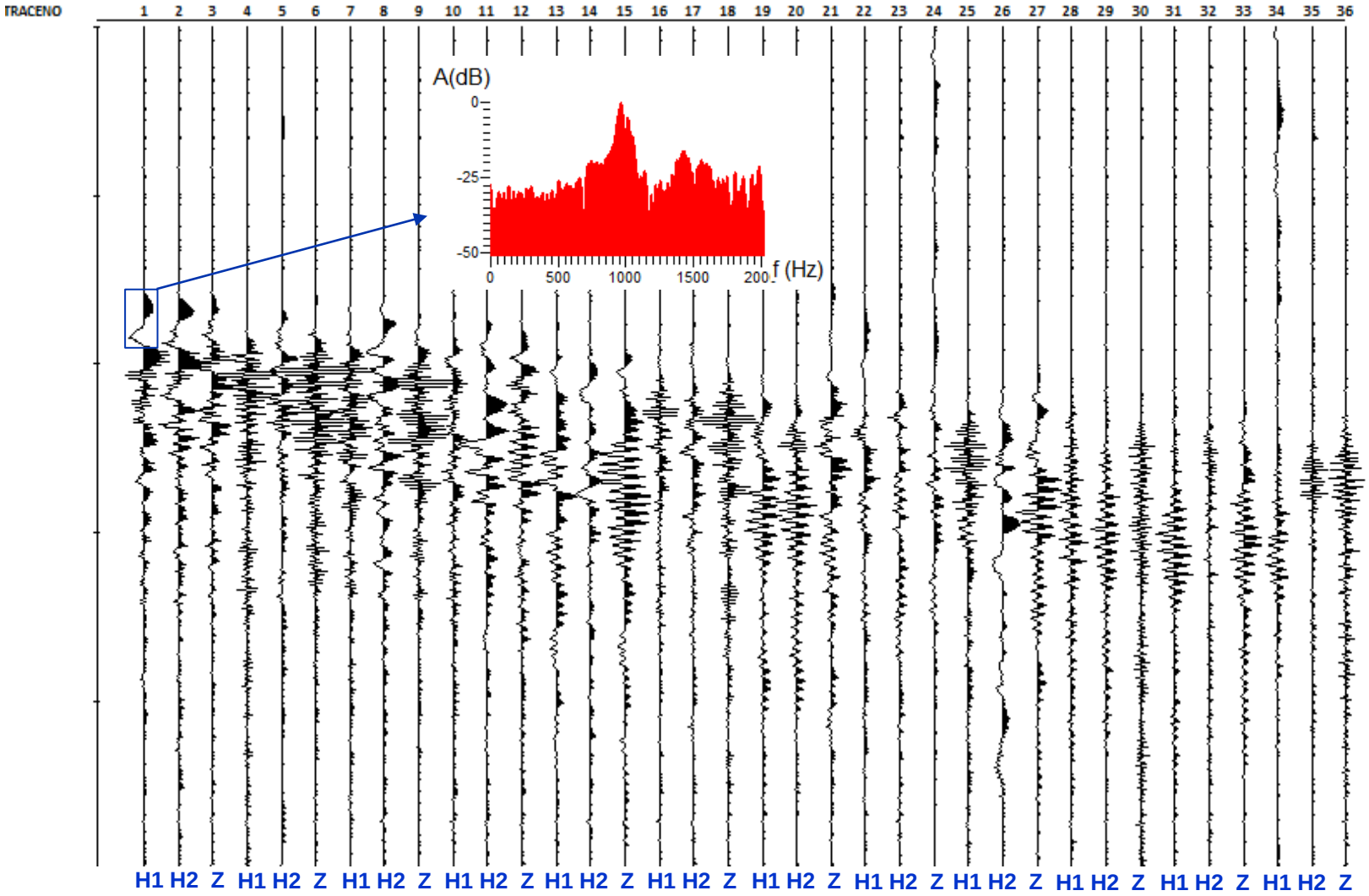
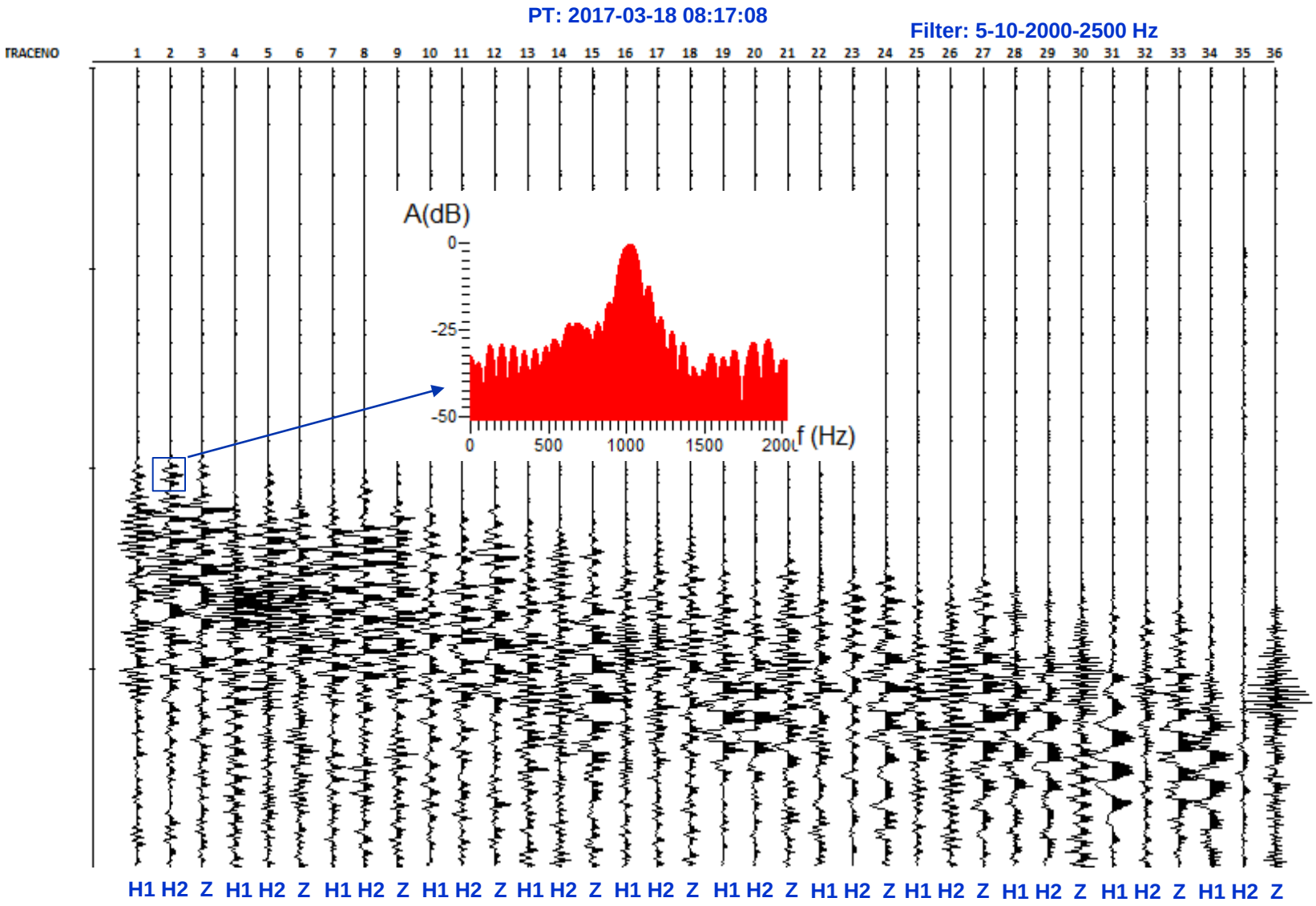


Tap Test



Tap Test

PT: 2017-03-19 08:27:52

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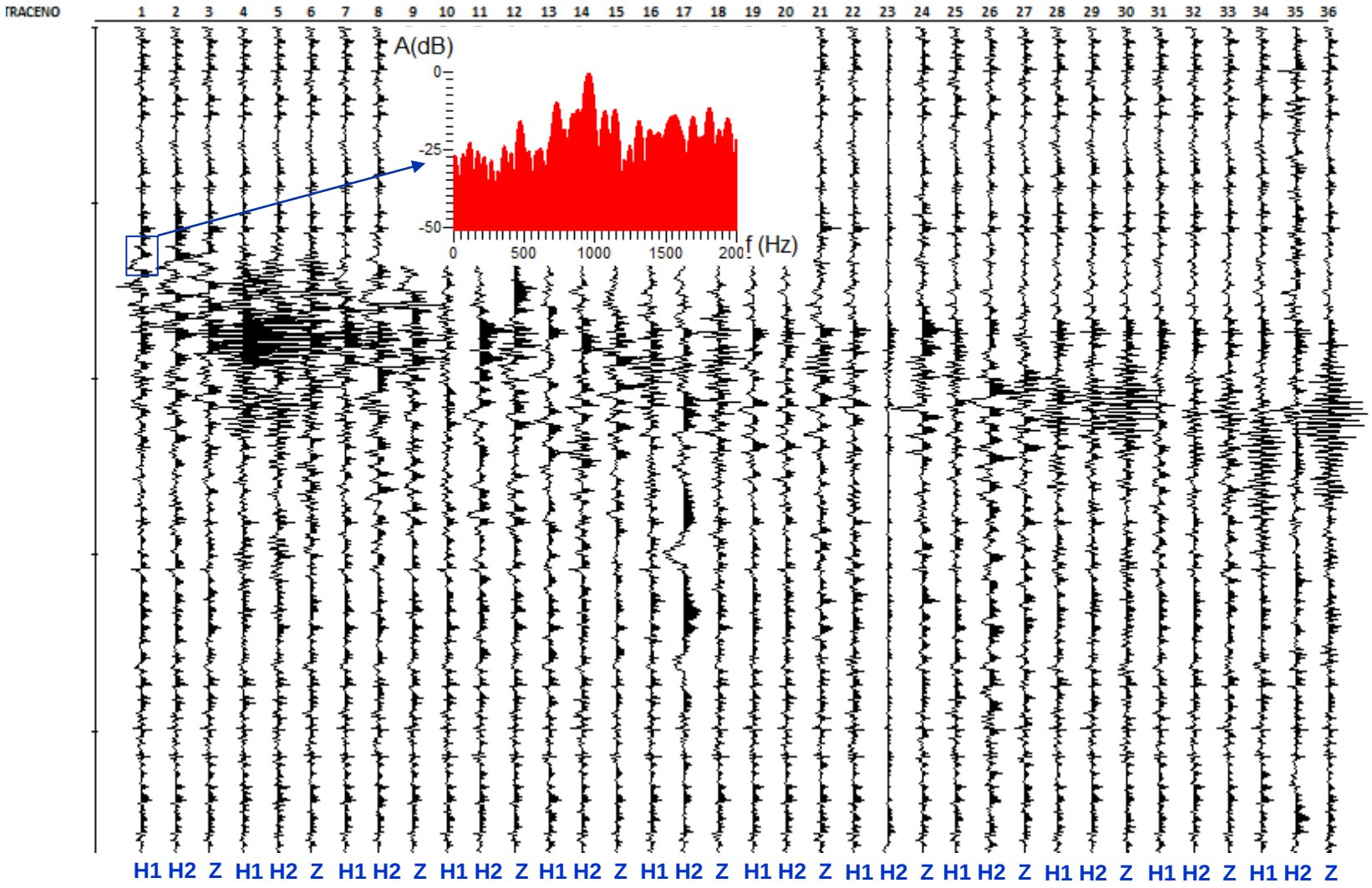

Tap Test

PT: 2017-03-20 08:16:10

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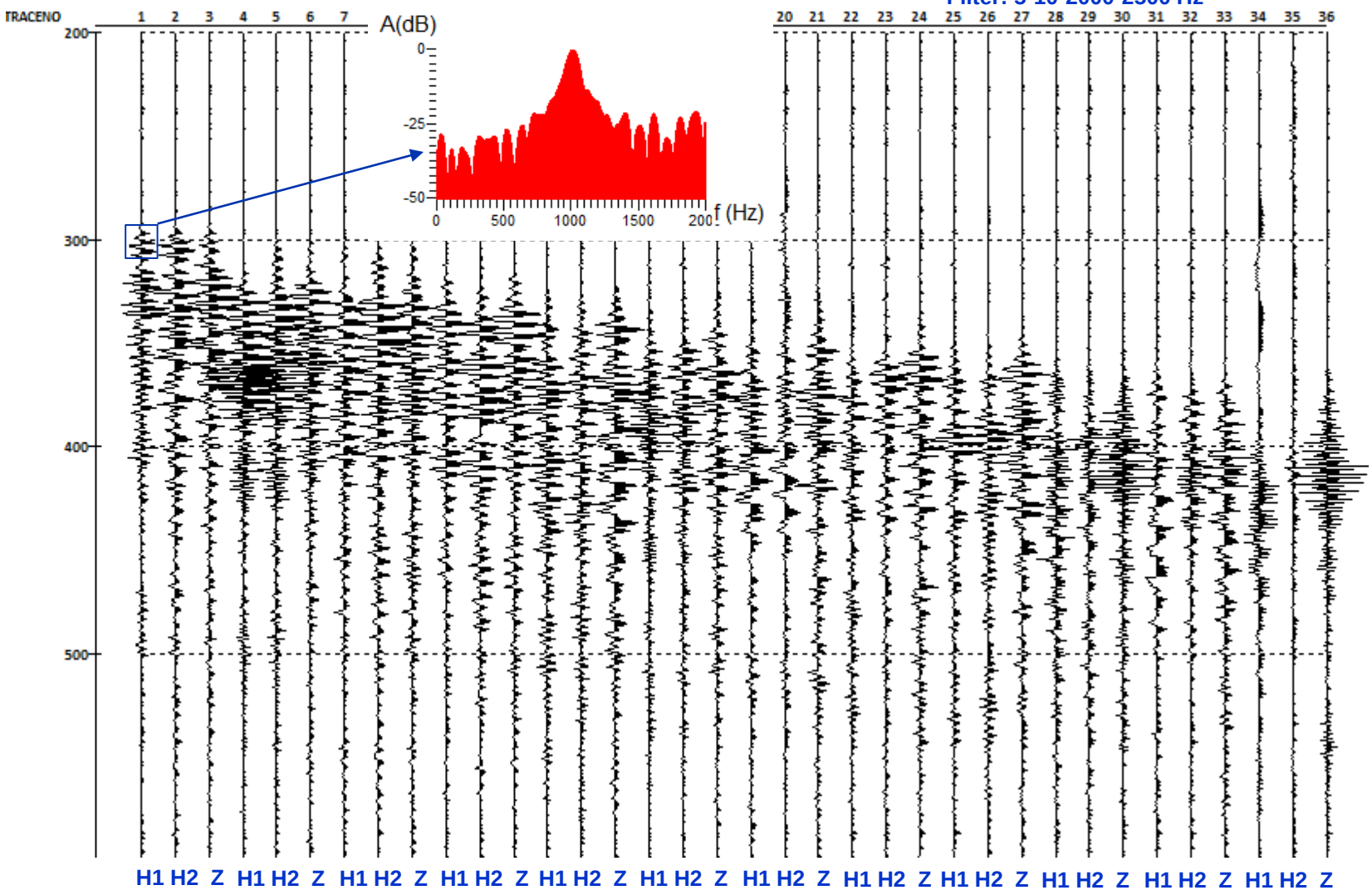

The End