513513 ADS - Trabajo Final 2024

Choose a recent earthquake (post 2020), of reasonable magnitude (7.0+ suggested), from the Pacific Ring of Fire, and perform the following analysis:

0) Form a WhatsApp/Teams group for the course, to ensure that every person chooses a different event!

1) Find a seismic station close to your event which has an accelerometer and seismometer installed and compare the waveforms of these instruments in units of m/s and m/s/s on the vertical and horizontal components. Repeat the analysis for a station 3000-9000 km away.

Explain the instrument properties and give examples of the benefits and limitations of each instrument concerning the waveforms you are seeing.

2) Find a seismic station which has a borehole seismometer installed (typically, they have a Station Depth of over ∼15 meters) and analyse the ambient noise levels on the borehole seismometer compared to the surface seismometer in the frequency domain. Analyse how the borehole seismometer improves the seismic signal of your chosen event.

Compare the seismic signal of your event between the borehole and surface seismometers at different frequencies to see if the signal noticeably improves by installing the sensor at greater depth.

3) Analyse the signal of your event of two seismic stations close to each other, one installed above bedrock and one installed in a sedimentary valley. Use spectrograms to compare the signals of the two stations, to investigate if certain frequencies are preferentially amplified by the sediments.

4) The Raspberry Shake network (AM) is a citizen-based science project with the aim to have a dense network of low-cost accelerometers online. For your chosen event, investigate which Shake stations around the world were online. If one has managed to record your event, analyse the signal (ENZ or EHZ channel) in the frequency domain to see how it compares to the sensor noise level. Alternatively, analyse the noise levels of one of these sensors to explain why such a sensor was incapable of recording your event.

5) Choose 5 stations that have recorded your event with different distances. Find the arrival time for the P and S-wave and perform a travel time plot displaying both on the same graphic.

Note: Extra credit may be given for additional analysis not specifically in the above list.

Evaluation:

The work will be evaluated through a sequence of presentations. The dates of the presentations will be communicated in the Teams channel at least 10 days before.