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High-frequency oceanic seismic waves observations in Juan de Fuca and Gorda plates

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High-frequency seismic waves (> 1Hz) contain valuable information indicating the existence of random heterogeneity in the lithosphere. These waves, namely Po and So coda, are typically characterized by their dominance over long distance range (up to 3000 km), high-frequency content and low amplitude decay. Their generation in the oceanic lithosphere is thought to be a result of multiple scattering of P and S waves linked to small-scale heterogeneities within the plate.

Previous efforts focused on plates of moderate (15-60 Ma) to old age (> 100 Ma) but no observation and modelling has been done aiming at very young plates (e.g., < 10 Ma).

In order to contribute to new insights on the nature of these waves in very young oceanic plates, we analysed P and S-coda waves recorded by Ocean Bottom Seismometers (OBSs) of Cascadia Initiative deployed in Juan de Fuca and Gorda plate. This effort will provide new constrain on the presence or absence of small-scale heterogeneities in a very young plate (< 10 Ma). We analyse apparent P wave velocity, radiation patterns of P wave, and amplitude decay of P and S-coda waves in three component seismogram envelopes over the frequency band of 1 to 16 Hz. The observations not only show changes in the P wave apparent velocity varying between 7.3 to 8.2 km/s, but also reveal considerable spatial variation in the amplitude decay of the P and S-coda. To obtain direct evidence of the azimuthal variation of the amplitude distribution, we analyse a series of envelopes in vertical component over a limited range of azimuth. The apparent radiation pattern obtained for P waves, shows important distortion of the pattern. Together, these results, suggest a distortion and a change in the velocity as frequency increases and they could potentially be explained by the presence of small-scale heterogeneities.