

# Title: Quality analysis of high-frequency air-gun shot seismic recordings in the Juan de Fuca plate.

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The goal of this study is to extract high-frequency seismic waveforms recorded by both offshore and onshore instrumentations, and to quantitatively evaluate the data quality in terms of source-to-receiver distance, water depth, and sediment thickness. There were two active-source seismic experiments within the Juan de Fuca plate, MGL1211 and MGL1212, from June 13<sup>th</sup> to July 24<sup>th</sup>, 2012, during the first year deployment of the Cascadia Initiative Amphibious Array. In total, we choose 114 ocean bottom seismometers and 211 inland stations located around the experiment region. The common receiver gathering analysis shows that most offshore stations located at deep water (>1.0 km) record clear first P-wave arrivals up to 150 km away from the air-gun shot. The first arrival transits from crustal phase Pg to head wave Pn at a source-to-receiver distance of 25-40 km. For stations located at shallow water, the seismic recordings appear much noisier compared to those of deep-water stations. Only 5 inland stations record clear air-gun shot signals up to 200 km away from the source. The sediment thickness estimated in this study increases from the ridge toward the continental margin. A few general trends are observed for the distribution of the signal-to-noise ratio of the first P-arrivals. First, the ratio decreases exponentially with the increasing source-to-receiver distance; Second, the ratio increases from shallow to deep water; Third, the ratio decreases with the increasing thickness of the marine sediment. And lastly, on average, the signal-to-noise ratio appears much lower at inland stations than at offshore stations.

