A Detailed Look at Pn Phases in the Western Pacific: Local Reverberations versus Scattering in the Deeper Lithosphere

*Donald W Forsyth[1]

1. Brown University

Oceanic Pn or Po phases propagate efficiently in old Pacific lithosphere. Their ability to propagate hundreds of km up a subducting slab and then travel thousands of km horizontally within the lithosphere while retaining their high frequency content indicates that there are strong, semi-horizontal heterogeneities within the plate that scatter and guide the waves (e.g., Kennett and Furumura, 2013). However, it is clear that reverberations within the water column and sediments contribute significantly to the coda of Po. In an attempt to sort out the relative contributions of local reverberations and lithospheric scattering to the coda, we examine in detail the waveforms of Po phases recorded on an array of ocean-bottom seismometers on 150-160 Ma seafloor south of Shatsky Rise. We separate Po into the upgoing and downgoing components by combining vertical and pressure records. Then stacking the auto- and cross-correlations of upgoing and downgoing records from many earthquake sources reveals the local reverberatory response. We model the stacked correlograms to infer local sediment/crustal structure using a reflectivity method. Reflections at the base of the sediments are just as important as reflections at the seafloor, but coherent multiple reflections are almost undetectable. Despite the relatively flat seafloor, changes in the stacked correlograms with back azimuth from individual stations indicate that variations in local sediment structure play a key role in randomizing the local response and minimizing coherent reverberations.

Keywords: Pn coda, Oceanic lithosphere

