Explore lowermost mantle structure with reflected and diffracted waves recorded by USArray

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Waveform modeling of the D'' SH wave triplication (Scd) beyond 70 degrees are commonly used to map velocity variations in the lowermost mantle. On the other hand, travel time and amplitude decay of diffracted P and SH waves (Pdiff and SHdiff) in the shadow zone (from 90 degrees to 140 degrees) are used extensively to study large scale lowermost mantle structure. Joint inversion of these two phases proves helpful in constraining the velocity structure due to their different sensitivities, analog to body waves and surface waves in studying crustal structures. However, they are not usually jointly inverted, due to lack of overlapping coverage. USArray, with its large station density and aperture, provides an unprecedented opportunity to study both reflected waves and diffracted waves jointly and increase the resolution and accuracy. Moreover, USArray records of earthquakes occurred from Kuril, Japan Trench to Taiwan present overlapping sampling of reflected and diffracted waves in the lowermost mantle beneath northern Pacific roughly along a great circle. Initial study indicated that inaccurate earthquake focal mechanism and station side structure (upper mantle, crust and site amplification) can cause systematic bias and strong scattering. Here we obtain high-accuracy focal mechanism and depth with 30-90 degree P and SH waves for the earthquakes we use, and correct the station side effect with reference earthquakes which sample similar station site structure. In this poster, we present result from this joint inversion of lower mantle velocity structure for both P and SH waves.