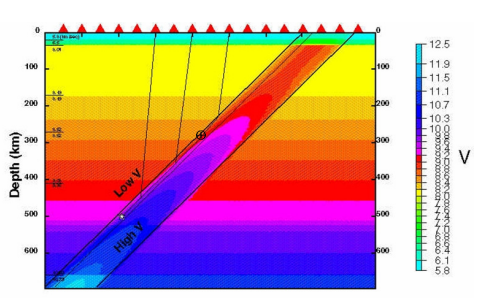
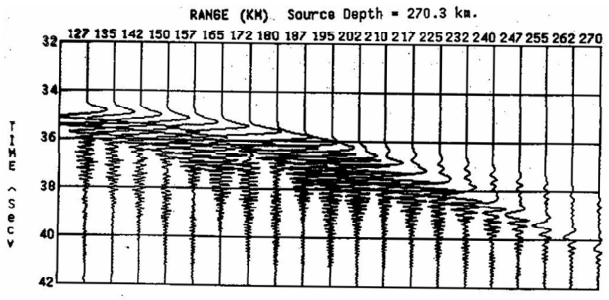
Recent Research Results: Jer-Ming Chiu

(1) Propagation of seismic waves in subduction zones from intermediate-depth earthquakes – (a paper in preparation)

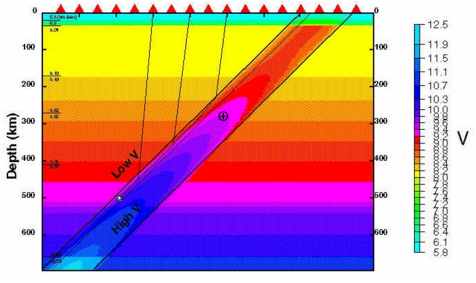
Summary: small amplitude P-wave precursor preceding an impulsive P-wave arrivals from intermediate-depth earthquakes are often observed at nearby seismic stations on the overriding plate. Time separation between the two P arrivals seems to proportional to the length of traveling path of seismic waves inside a subduction zone. Preliminary results from waveform modeling reveal that intermediate depth earthquakes with two distinct P arrivals must have been located at near the upper boundary of a subduction zone that (1) the small amplitude first arrival can be interpreted as the head waves traveling toward the higher velocity interior of the subduction zone to arrive station earlier, and (2) the large amplitude second P arrival can be interpreted as the seismic waves traveling along the uppermost region of a subduction zone where seismic velocity is slower than the interior of the slab and velocity gradient is the highest. Currently, we are exploring seismograms from intermediate-depth earthquakes from the double Benioff zones beneath the central Japan region to complete the study.



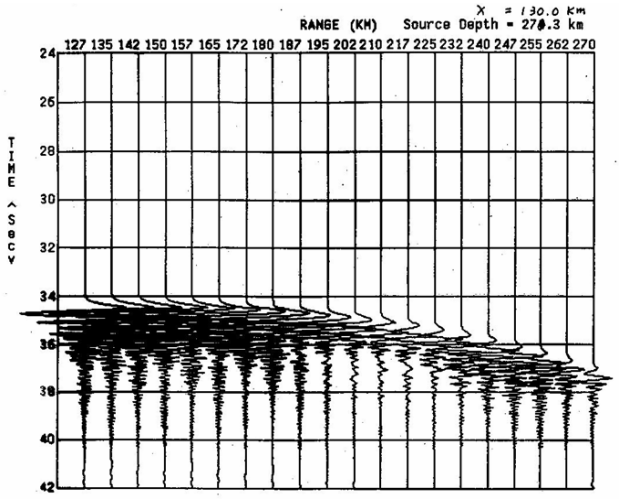
(a)



(b)



(c)



(d)

Figure (a) index map showing earthquake is located near the upper surface of the subduction zone, (b) synthetic P-waves observed at stations on the overriding plate showing that P-wave precursors can be observed at stations closer to the trench and the time separation between the two P-arrivals seems to increase for stations closer to the trench, (c) index map showing that source location is shifted laterally to the middle of the slab, and (d) synthetic P-waves from model in (c) showing that no P-wave precursors can be observed when earthquake source is located inside the middle part of the subducting slab.