I075-022 Room: IC Time: May 28 11:30-11:45

Small-scale Seismic Heterogeneities Asoociated with Subducting Mariana Slab in the Uppermost-lower Mantle.

Satoshi Kaneshima[1]

[1] Earth and Planetary Sci.,Titech

Short period seismic array data of western US
for 15 deep eathquakes at the mariana subduction zone near 19deg N
show packets of anomalous later phases after direct P waves. Two largest wave packets
have arrive times relative to the P waves around 13 seconds and 29 seconds.
The amplitudes of the two phases vary upto an order of magnitude from event to event,
and correlate with each other for the indivdual events.
The large amplitude variation precludes
receiver side reververations as the origin of the waves and the correlation
suggests that they are of similar origin. Across the entire array, the earlier
of the two (called 13s phase) is often visible as an isolated wavelet even
on single traces, and has the slowness and arrival azimuth which are not
discriminated from those of the direct P above the resolution limit
of the array analyses.
It also posseses an important feature that its delay time is nearly constant
hardly depending on the focal depths, which precludes as the origin of the phase
S-to-P wave conversions at horizontal discontinuity beneath the foci.
The latter wave (called 29s phase) indeed arrives as a more emergent
wave packet continuing during a period nearly from 27 to 31 seconds after P,
therefore not showing systematic delay time-focal depth trend.
Its slowness and azimuth clearly differ from those of the direct P by
about 0.1 sec/degree, and upto 2 degrees, respectively. Their dominant
slowness and azimuth, however, markedly vary among the array from north to south.
We investigate the sources of the anomalous later arrivals by
computing the P-to-P and S-to-P scattering likelihood with the arrival time, slowness,
and azimuth of the later arrivals measured by seismic array techniques relative
to direct P waves, and, by computing semblance coefficients.
Based on the semblance values, consistency of the scattering points for
the entire array, and on the radiation intensity, both waves are most reasonalbly
interpreted as S-to-P converted waves. The S-to-P scattering points corresponding to
the two waves are located in the uppermost lower mantle north of the focal region.
The 13 s phase is located at (19.5deg-20.0deg N, 145.5deg-146.0deg E, 700-720 km),
and the geometry the scattering object seems to be a sheet-like feature which is
steeply dipping, mainly based of its obvious independence of delay times on
focal depths and the semblance distribution,
athough the geometries of the objects are difficult to delineate with
certainty because of the limited size of source region.
On the other hand, the source of the 29 s phase wave packets appears to split into two
objects (20.deg-21.deg N, 145.deg-145.5deg E, 880-900 km,
and 20.5¥deg-21.0deg N, 147.0deg-147.5deg E, 860-900 km). The geopmetry
of the sources are even more difficult to resolve than that of 13 s phase,
but horizontal discontinuity is clearly precluded as a sourece because
of its positve relative slowness and zimuthal deviation rekative to P.
S-to-P converted waves at the 660 km discontinuity are not identified as
clearly as these anomalous waves,
but appears to be depressed down to nearly 690 km beneath foci.