

Wavefield of sP and pP phases from offshore earthquakes in northeastern Japan

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sP phase is an S to P converted waves at the ocean bottom or sea surface. Some researchers have used this phase from the offshore earthquakes in northeastern Japan to improve the depth accuracy of the earthquakes. However, the wavefield and propagation characteristics of this phase have not been well studied. Here I examined the characteristics by applying some simple visualization techniques and 3D wave propagation simulation. One technique is the simulated broadening of seismograms from the Hi-net network by correcting for the characteristics of the short-period seismometers. This correction enables us to investigate seismogram's lower frequency components that are less sensitive to short-wavelength heterogeneities in the lithosphere. The other technique is the visualization of low-pass filtered and auto-gain-controlled seismograms as wiggle traces. Thus, we can easily trace some converted phases on the paste-up seismograms. A comparison of simulated and observed seismograms is also quite useful to investigate the origin of converted waves. I used OpenSWPC code and velocity and attenuation structure based on the JIVSM model. I applied these techniques to some inter-plate earthquakes that occurred offshore Miyagi prefecture in northeastern Japan. I could identify both pP and sP phases from almost all examined earthquakes. These phases appear as a continuous phase on paste-up seismograms as far as 400 km epicentral distance. The time difference between these waves and P-waves varies with the source location, reflecting the depth difference between the earthquake and ocean bottom. Since the converted waves appear as continuous wave packets crossing station network, picking of arrival times from limited time bands determined from the paste-up records can improve the data accuracy, and hence the location accuracy. The use of pP phase together with sP phase will provide a new method to improve the depth accuracy of offshore earthquakes, which is important to investigate the seismicity in the period before the operation of the S-net, the ocean-bottom seismometer network covering offshore from Hokkaido to Kanto district.

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