Bend faulting and a large seamount in the central Japan Trench

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Hydration of the subducting oceanic plate determines the amount of water transported from Earth's surface into its interior, and plate bending-related normal faulting just prior to subduction is considered to promote hydration. The development of the bend faults varies among subduction zones dependent on to various factors such as the angle between the current trench axis and the past spreading axis, and these variations in bend faulting is considered to control regional variations in water transportation.

Since 2009, to reveal the nature of the incoming oceanic plate and its structural changes owing to bend faulting prior to subduction, we have conducted several extensive controlled-source seismic survey in the trench-outer rise areas of the northwestern Pacific margin. We confirmed oceanic plate is systematically altered by bend faulting near the trench and the alteration generally starts at 150 km from the trench axis.

In the outer trench area of the central to southern Japan Trench off Fukushima, there are many large seamounts near the trench axis on the incoming oceanic plate. In 2017, to investigate the impact of these seamounts on the bend faulting, we conducted an extensive controlled-source seismic survey using multi-channel seismic (MCS) reflection system and Ocean Bottom Seismometers (OBSs) across one of the largest seamount located at about 100 km from the trench axis. Unfortunately, the coverage of the seismic reflection data collected by MCS system was not good because of bad weather condition. Therefore, we applied seismic interferometry to the OBS data and created a seismic reflection profile to compensate the MCS data. Together with these seismic reflection profiles, we applied travel-time tomographic inversion using the OBS data to determine P-wave velocities. Although we could not constrain the detailed seismic structure around the seamount because of poor seismic reflection data, our preliminary P-wave velocity model derived from the OBS data implies that the impact of the existence of the seamount to the bend faulting is confined to narrow area. In this presentation, we will show the obtained seismic velocity model in comparison with those of the northern Japan Trench area and discuss the potential impact of the seamount on the bend fault hydration.

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