Along strike structural variation in the central to northern part of the Japan Trench axis region

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Great earthquakes have occurred along the Japan Trench subduction zone, and some of them, e.g. Meiji Sanriku earthquake in 1896, could have ruptured the shallow portion of the plate boundary fault similar to the 2011 Tohoku earthquake. Geological/geophysical structure in the vicinity of the trench axis is one of the keys to understand the nature of shallow mega thrust events and tsunamigenesis. We have conducted high resolution seismic surveys in the northern part of the Japan Trench axis region in 38 –40.5 N to investigate the detailed structure in the trench axis area. Thrust faults and possible slope failures are observed landward of the trench axis, beneath the lowermost landward trench slope. The deformation and evolution styles of the lowermost landward slope show variation along the trench strike. To the south of the survey area in 38 –39 N, imbricate thrust-and-fold packages is observed but limited within the vicinity of the trench axis. Thickness of the hanging wall sediment is relatively thinner in the lowermost landward slope. These observation could suggest that the lowermost slope has not been well developed in this area. To the north around 40 –40.5 N, frontal thrusts and imbricate structure are clearly observed on the seismic profiles through ~ 10 –15 km landward of the trench axis. Thickness of the hanging wall sediment is thicker in this area. The bending-related faults on the subducted plate are generally not located beneath the lowermost slope up to ~ 10 km landward of the trench. These observations suggest that the imbricate structure has been well developed in the last ~ 10 kyr in this area. Around 39.5 N, it is suggested that slope failures have occurred. The trench axis is filled by slump deposits and debris with chaotic acoustic characteristics. Above mentioned variations in the deformation and evolution style in the lowermost landward slope could affect the mechanism of tsunami generation in the northern Japan Trench. The variation on the thickness of the incoming sediments is also identified along the trench strike. The variation of the sediment thickness on the incoming plate and its relation with the throw of the bending-related normal fault could also be an important factor for the tsunami generation caused by the shallow mega slip events in the northern Japan Trench. In 2015, another high resolution seismic survey was conducted in the Japan Trench off Miyagi-Fukushima region. We acquired 20 seismic profiles and will introduce initial results in this presentation.

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