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Room:Convention Hall

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Fault System of the 2011 Off-Tohoku Earthquake; Insight from Seismic Reflection Data and Seafloor Observations

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Faults related to the tsunamigenic 2011 off-Tohoku earthquake (Mw 9.0) were investigated by using multi-channel seismic reflection data acquired in 1999 and submersible seafloor observations from 2008. The shallow fault geometries as well as submarine slide are important to reveal mechanisms of the huge tsunami generation. On the reflection seismic profile, we identified three predominant faults; (A) backstop reverse fault working as a boundary between seaward accreted sequence and landward consolidated sequence, (B) a branch fault constructing the seafloor slope break, and (C) vertical fault extending toward a seafloor ridge. Several imbricate thrusts are developed within the accreted sequence seaward of (A) backstop reverse fault. Between (A) the backstop reverse fault and (B) the branch fault, underplating structures are identified on the profile. Displacement along (C) the vertical fault has offset a Cretaceous sequence surface by ~800 m. The location of these faults interpreted in the seismic reflection profile is distributed around the area with largest slip and tsunami induction of the 2011 event. Cold-seep communities and a high scarp observed at these fault traces suggest current activity on these faults. We interpret the fault system in the seismic profile as a shallow extension of the seismogenic fault that may have contributed to induction of the huge tsunami.