

Turbidite paleoseismology in the Japan Trench floor: Results from Sonne SO219A and Mirai MR12-E01 cruises

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The large sea-floor displacement in the Japan Trench slope by the 2011 off the Pacific Coast of Tohoku earthquake was inferred from the repeated bathymetric surveys. Because the Japan Trench is a remarkable depression near the epicenter, the gravity flows generated by the earthquake and its related phenomena might be focused in the depression (more than 7500 m in water depth) and might form the gravity flow deposits like turbidites. Therefore, the Japan Trench is a target area to detect the past earthquake event deposits. To obtain the past earthquake records, we conducted two survey cruises; Sonne SO219A and Mirai MR12-E01 cruises. All of the cores obtained from the Japan Trench floor by two cruises (3 cores by Sonne and 4 cores by Mirai) showed the same lithostratigraphy. The 2011 event deposits, which were composed of thin sand at base and diatomaceous mud/ooze with multistoried upward fining grading structure, occurred at the uppermost part of the cores. Below the 2011 event deposit, at least three thick (several tens cm to a few meter thick) turbidite units were recognized. Third turbidite unit was very unique and was characterized by the calcareous nanno fossil bearing turbidite muds suggesting the transportation from upper-mid slope. A volcanic ash from the Towada volcano intercalated in hemipelagic mud between second and third turbidite units. Results on our tephra correlation using geochemical and petrographic properties suggest that the ash might be correlative to Towada-a ash, which occurred just above the Jogan tsunami deposits on the Sendai Plain. Radiocarbon dating using bulk organic carbon and radiolarian faunal assemblages suggested that the ash horizons are the Holocene deposits. Exact correlation of the ash layer is very important to connect the deep-sea event deposits in the Japan Trench and on-shore tsunami deposits on the Sendai Plain. The result indicates that turbidite along the Japan Trench might give us important information on the spatio-temporal occurrence of the past earthquakes.

Keywords: turbidite, paleoseismology, Japan Trench