

Deep-sea environmental changes on the continental shelf off Sanriku, Japan, before and after the 2011 Tohoku Earthquake

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The Tohoku Earthquake (M=9.0) occurred off the Pacific coast of Sanriku, Japan, on March 11, 2011 brought about strong shaking and huge tsunamis along the entire Pacific coast of the Tohoku area. The earthquake and many aftershocks caused mass sedimentation events on the continental shelf, slope, and trench bottom off Tohoku area. To investigate the impacts of the earthquake on the deep-sea environment, we conducted surveys off Sanriku onboard a research vessel of JAMSTEC during 2012-2018 with conductivity-temperature-depth (CTD) profiler, light transmissometer, multiple water sampler. The turbidity in the bottom layer deeper than 1000 dbar on the continental slope calculated from the light transmissometer anomaly was observed to be ~4%, which is higher than usually observed values near the calm bottom. Associated with the turbidity increase caused by disturbances of sediments due to aftershocks, the dissolved oxygen (DO) concentration in the bottom water was found to be decreased. In addition, we examined CTD and DO data collected off Tohoku area during 2005-2018 by the Japan Meteorological Agency. Based on comparison of DO in the deep layer between 1000 and 2000 m before and after the earthquake, we found that DO significantly dropped by 5-7 $\mu\text{mol}/\text{kg}$ after the earthquake. The DO was still observed to be low in 2018 along the entire Pacific coast of the Tohoku area. The deep-sea environment changed after the earthquake might be preserved by disturbance of sediment due to continuing aftershocks.

Keywords: the 2011 Tohoku Earthquake, continental shelf, deep-sea environment