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Holocene subsidence estimated by depositional process of the Rikuzentakata plain,northeast Japan

NIWA, Yuichi[1*] ; TODA, Shinji[1] ; SUGAI, Toshihiko[2]

[1]International Research Institute of Disaster Science, Tohoku University, [2]Graduate School of Frontier Sciences, The University of Tokyo

Time-dependent inconsistency of crustal movement is suggested in the Sanriku coast, northeast Japan. Coseismic subsidence up to 1.3 m of the 2011 M=9.0 Tohoku-oki earthquake and a century-long subsidence rate of 1 ? 10 mm/yr is reported in the previous study. In the north part of the Sanriku coast, this short-term subsidence apparently contradict to long-term uplift rate of 0.3-0.5 mm/yr estimated from a flight of Pleistocene marine terraces. In the south Sanriku coast, long-term crustal movement is unknown because of fragmentary distribution of marine terrace and lack of age data.

This study detected predominance of subsidence during the Holocene from total five core data of the Rikuzen-takata plain, the southern Sanriku coast. On the basis of feature of core sediment, sedimentary facies was divided into braided river, tidal influenced environment, delta, and terrestrial marsh, from lower to upper, in ascending order. Age-depth curve was described based on twenty-five 14C ages. For the estimation of Holocene vertical movement, observed relative sea-level (RSL) was compared with theoretical RSL. RSL at 10 to 9.0 ka was estimated at the altitude of -30 to -27 m by using altitude of depositional surface of tidal deposits shown by both age-depth curve and molluscan shells in intertidal zone. Estimated RSL is lower than theoretical RSL without tectonic effect. Probable cause of this discrepancy is Holocene tectonic subsidence of the studied area.

Geologic cross-section with one thousand year isochrones on the basis of about fifty radiocarbon ages shows that sediment stacking pattern is retrogrational at 10 to 8 ka whereas aggradational after 8 ka. Depositional landform at 6 ka, when relative sea-level without tectonic effect is same or slightly higher than present sea-level, shown as isochrone at 6 ka is buried under the present delta system. This indicates predominance of subsidence during the past 6 ka. Detected subsidence is consistent with coseisimic subsidence of the 2011 event and a century-long submergence.

Keywords: Holocene, Sanriku coast, subsidence, Rikuzentakata plain