Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG57-P30 Room:Convention Hall Time:May 27 18:15-19:30

Holocene vertical movement history in northern Sanriku coast, NE Japan, related to megaquake cycle

KIKUCHI, Ryoichi[1] ; MIYAUCHI, Takahiro[2*]

[1]Dept.Earth Sci., Fac. of Sci., Chiba University, [2]Dept.Earth Sci., Grad. School of Sci., Chiba University

The 2011 off the Pacific coast of Tohoku Earthquake (The 2011 EQ below) was associated with the distinct subsidence along the Pacific Coast of NE Japan in addition to inter-seismic rapid subsidence by the asperity (coupling) of Eurasia (North American) plate and Pacific plate (Ozawa et al., 2011). Especially, the southern Sanriku coast which largely subsided has been reversely uplifting as an after-slip movement, recovering one fourth of coseismic subsidence (GIS, 2014). If after-slip movement continues at the same speed, the coast will start inter-seismic subsiding by the reinforcing interplate coupling after relatively short recovery of coseismic subsidence (Ikeda, 2014). According this scenario, the vertical movement of northern Sanriku coast out of the 2011 EQ source area is possibly controlled by the similar megaquake cycle. We reconstructed the vertical movement history in the southern Sanriku coast based on the mapping of Holocene emerged coastal topographies and ages, and examined the megaquake cycle managing the history considering the geodetic subsidence measured at the tide-gauge station.

Tephrochronologically age-determined MIS 5e marine terrace height of 30 m shows average uplift rate of 0.2 mm/yr in geological long term. Holocene emerged coastal topographies and dates present three times of rapid uplift events; about 1,000 years ago just before B-Tm ash fall, before 3,300 years ago and before 4,800 years ago. Records of Hachinohe tide-gauge station in the past 60 years indicate the mean subsidence rate of 2 mm/yr. We built the vertical movement diagram synthetically explaining the above results.

Emergences of coastal topographies suggest three sudden uplift events which are named E1, E2 and E3 in chronological order. Assuming that the geodetic subsidence (2 mm/yr) continued during 1,000 years between E3 and the present, E3 was associated with 6-7m uplift. Setting that the gradient of straight line connecting heights of emerged topographies attained just after uplift events satisfies the long-term uplift rate of 0.2 mm/yr, E2 was accompanied by 5-6 m uplift 3,800 years ago, and E1 by 4-5 m 6,200 years ago. These abrupt uplift phenomena is likely generated by an near-shore faulting (Miyauchi, 2012), which is not sufficiently testified by geophysical exploration yet. Correlating these uplift events with the ongoing after-slip uplift event after 2011 EQ, plate-boundary megaquakes associated with distinct coseismic subsidence necessarily occurred off the northern Sanriku coast, namely from the northern Japan Trench to the southern Kuril Trench, just before those uplift events. Such megaquakes are estimated to occur at least three times in Holocene.

Keywords: Holocene, Emerged coastal topography, Vertical movement history, After-slip movement, northern Sanriku coast, megaquake