Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SSS31-21 Room:302 Time:May 22 11:30-11:45

What determines Mw7 or Mw8?

Arito Sakaguchi[1*], Yuzuru Yamamoto[1], Yoshitaka Hashimoto[2], Robert Harris[3], Expedition 344 Scientists[4]

[1]IFREE/JAMSTEC, [2]Kochi univ., [3]Oregon State University, [4]IODP

Variations in earthquake magnitude and recurrence intervals of fault behavior need to be understood in the context of regional tectonics. Convergent margins may be divided into two end-member types that are termed erosive and accretionary plate boundaries (e.g. von Huene and Scholl, 1991; Clift and Vannucchi, 2004). The Nankai accretionary margin has a 1300-year historical earthquake record with a recurrence interval of 100-150 years (Ando, 1975). In contrast, the Middle America trench offshore Costa Rica represents an erosive margin characterized by magnitudes as high as 7.6Mw, with a recurrence interval of several decades.

CRISP (Costa-Rica Seismogenesis Project) Program-A has carried out the first step toward deep riser drilling by characterizing the shallow lithologic, hydrologic, stress, and thermal state of this area (Vannucchi et al., 2011; Harris et al., 2013). CRISP drilling of Exp. 344 reveals that the shallow upper plate crust is composed of terrigenous sediment accumulated at a high rate. The Costa Rica seismogenic zone is characterized by the subduction of young oceanic crust with high heat flow and active fluid flow (Spinelli and Wang, 2008; Spinelli and Harris, 2011; Harris et al., 2010). These characteristics are similar to the Nankai seismogenic zone (Kinoshita et al., 2008). Some differences exist between both margins including the convergence rates, the thickness and composition of incoming sediments, and physical properties of the crust. Among them, P-wave velocity within the upper plate of the Costa Rica margin (Stavenhagen et al., 1998) is much higher than at the Nankai margin (Nakanishi et al., 2002). In frictional stick-slip systems, the recurrence interval and event displacement varies with the stiffness of the system. We propose that the characteristic magnitude of large subduction earthquakes and recurrence intervals are influenced by the stiffness of the upper plate. This hypothesis may be best tested at the Nankai and Costa Rica margins.

Keywords: Large subduction earthquake, seismogenic zone drilling, accretion and erosive margin