

Possibility of a hyper-earthquake along the Ryukyu arc

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It is commonly believed that the plate coupling along the Ryukyu subduction zone is weak. For this ground, little attention has been paid to the possibility that a great or hyper-earthquake like the 2004 Sumatra-Andaman earthquake would occur along the arc. However a series of evidence of large coastal uplifts and large tsunamis which have been found on Ryukyu islands indicates a possibility of great earthquakes there. Coastal terraces on Kikai Island in the northern Ryukyu arc suggests four large uplift events in the last several thousand years. These intermittent crustal uplifts indicate that the plate coupling along the arc is sufficiently strong to accumulate strain in the upper plate. It is well known that similar uplift events with long recurrence intervals took place along the coast of southwestern Honshu, Japan where great earthquakes have repeatedly occurred. It should be stressed that these large uplifts were not caused by earthquakes with a single fault segment such as the 1946 Tonankai earthquake, but by hyper-events with multi-segments like the 1707 Hoei earthquake. The similarity in the crustal deformation mode indicates that the two subduction zones possess similar conditions in plate coupling. Hereby, we propose a hypothesis that the Ryukyu arc would cause a multi-segmented hyper-earthquake. The worst scenario is that the whole segments from southern Kyushu to Taiwan could rupture at the same time. This scenario is supported by the fact that coastal uplifts at various locations took place almost simultaneously along the Ryukyu arc, although the data of coastal uplifts and tsunamis in this region are insufficient, further studies are necessary. Since we have no definite method to identify the location of a future hyper-earthquake like the 2004 Sumatra-Andaman earthquake, the working hypothesis presented here is valuable for evaluating a future earthquake disaster.