Ryukyus subduction: aseismic? or incomplete historic data? or unknown coupling dimension?

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It is widely believed that the subduction along the Ryukyus is aseismic without any significant earthquakes based on the absence of large earthquake (M>8) in the region. This perception is deduced mainly on the known historical earthquakes together with the fact that GPS observations are consistent with the relative plate motions in the area. However, the lack of M>8 earthquakes can be due to the incompleteness of written history in relation with the lengthy subduction evolution (e.g. long recurrence interval of 500y or longer). Furthermore, at present, the consistency between GPS measurements and relative plate motion is still an indeterminate proof of an aseismic subduction.

Taking into account the above uncertainties and the amount of possible damages of an M8 earthquake from Ryukyus on southern Japan, we examine the possibility of seismic subduction along the Ryukyus with the following hypothesis. A coupled interface between the slab and overriding plate in the upper 30-70km portion of the interface from the seafloor with a slip deficit (back slip) with a dip angle of 8cm and 20 deg, respectively is assumed. The width of the coupled portion is 30km that would produce at least 4mm northwestward horizontal displacement on the island, 50km wide 8mm displacement, and 16mm displacement 70km lengthwise. With such setting and in the case of a coupled slab interface of the upper 50km or less, presuming some error of the plate motion, it would be difficult for the GPS observations to distinguish whether or not the two plates are locked. If such coupling portion exists on the Ryukyus, the accumulated slip for the last 1000y is about 80m. Apparently, this amount of slip could trigger large magnitude earthquake(s) along the Ryukyu trench and could produce a large tsunami.

Considering the above possibilities and the question about Ryukyus plate boundary coupling conditions, we hereby propose an observation technique to solve the current by using the ocean-bottom crustal deformation system. This technique has a present accuracy of 5cm +-1cm in a 3- or 4-day duration per observation period during summer seasons. At least two years is the minimum observation period with the first year focused on the installation of ocean-bottom transponders near the trench axis and towards the shore and the collection of baseline data.