“The Sundaland plate boundary: earthquakes, volcanoes, and gold”

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The Sundaland here is a drowned, glacial continent covering Malaysia peninsula, Singapore, Sumatra, Jawa, Bali, and Kalimantan. I will review the Sundaland neotectonics, particularly Sumatra-Jawa, highlight earthquake and tsunami events in the past 15 years, and discuss about predictions of future major events. I will also discuss present active-fault architectures, their plausible tectonic evolutions, active volcano-magmatic belt and their spatial relations to gold deposits. The west and south margin of Sundaland bounded by a subduction zone aligning southeast from the Andaman Sea to Sunda Strait then it bends easterly toward Bali. In the past 15 years, the megathrusts, seismogenic parts of the subduction, have been very productive releasing big earthquakes since the world-shocking 2004 Aceh-Andaman megathrust-tsunami, which then was echoed by a deadly orchestra of numerous megathrust events including the 2005 Nias-Simelue (Mw 8.7), the 2006 South Java tsunami-earthquake (Mw7.9), the 2007 Bengkulu-Mentawai tripple events (Mw 8.4, 7.9, 7.0), and the Pagai-Mentawai tsunami-earthquke (Mw 7.8). The Sunda hinterland was cut by large numbers of active faults in concert with the subduction zone to accommodate relative plate motions. The most prominent structures are the trench-parallel dextral strike-slip system accommodating right-lateral component of the oblique convergent, the Sagaing fault system in Burma and the Sumatran fault system (SFS), connected by mid-Andaman spreading center. The highly segmented SFS posing 18 major fault breaks, mostly extensional stepovers. The SFS is co-located with the active magmatic belt. Several volcanoes and gold deposits spatially related to the major fault breaks. The bulk of the volcanoes, however, are controlled by the isobath between 100 to 200 km depth to the Benioff zone. The observed maximum offsets across SFS is no more than 25 km. The measured sliprates along the SFS ranges from 10 to 30 mm/year, then it suggests that the present SFS may only about one to three million years old (Ma), which is much younger then the Andaman spreading center around 10-15 Ma. Interestingly, it seems to correspondent with the facts that some major gold deposits in and around the SFZ are formed in the same period of the SFS onset. Since early 19th century, numerous major earthquake ruptures are well documented along the SFS and are appeared to be size-limited by the major fault breaks. After the 2004 megathrust event, the seismicity along the SFS has been increased. The 2007 twin earthquakes (Mw 6.4 and 6.3) ruptured two major segments of SFS in central Sumatra. In 2009, about 12 hours after the Padang-west Sumatra earthquake (Mw 7.7), the Mw 6.7 earthquake ruptured the fault segment in the southern SFS, south of Kerinci Lake. The inland Java active faults are also numerous but less pronounced with historical earthquakes less than Magnitude 7. However, earthquake shaking in Java can be deadlier since it is highly populated with lots of sub-standard building constructions. The recent 2006 Jogyakarta earthquake (Mw 6.4) on previously-considered-inactive Opak fault killed about 500 people.