

Source fault models of the 1768 earthquake and the 1791 tsunami near Okinawa-jima, central Ryukyu.

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Central Ryukyu has been assumed as low risk area for interplate earthquakes because interplate coupling is weak and large earthquakes (about M8.0) had not been recorded historically for about 300 years. However, two historical tsunamis, which occurred near Okinawa Island on 1768 and 1791, were recorded in the old document 'Kyuyo' (formal chronicles of Ryukyu). I investigate the source fault model of two tsunami event using numerical simulations of tsunami and earthquake shaking, and show that their events would be interplate earthquakes.

One earthquake occurred at noon of July 22th, 1768. The rockwalls of castle, grave of royal family were collapsed by the earthquake shaking in Shuri area, Naha, Okinawa Island. The rockwall of temple was damaged in Urasoe. After the shaking the tsunami arrived Naha port and Zamami Island. Recorded tsunami heights were about 1 m at Naha port. Nine houses and rice fields were damaged by the inundation of the tsunami in the Zamami Island. Estimated tsunami heights were 4-5 m in Zamami Island. The numerical modeling of tsunami and the estimation of earthquake shaking using empirical formula were employed, and the fault parameters of the 1768 earthquake were estimated. The faults were set to Okinawa Trough (M7.4 normal faults), Kerama Gap near Zamami Island (M7.4 normal faults), and Ryukyu Trench (M7.9 thrust faults). The computed tsunami heights and intensities of ground shaking of the M7.9 interplate earthquake model are consistent with to the recorded.

Another tsunami was also recorded in the Kyuyo. The abrupt abnormal increases of sea-level were recorded in the Okinawa Island on May 13th, 1791. The recorded tsunami heights were 1.5 m at Naha port, 2 m at Motobu (Toguchi), and 11 m at Yonabaru (eastern coast of Okinawa Island). Large historical earthquakes have not been reported around the Pacific Ocean in this period. The numerical simulation of tsunami was employed to estimate the fault parameters of the 1791 tsunami. The computed tsunami heights of the M8.2 interplate earthquake model, whose top is along the Ryukyu Trench, are consistent with the recorded ones.

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