Estimation of the source of tsunami accompanied by the 1596 Keicho-Bungo earthquake

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Inversion, which introduce heterogenity to fault slip by using tide gauge records, has been carried out from about 1990(ex. Satake et.al.,1989). However there are many historical tsunamis, which have no tide gauge records. For such historical tsunamis,if dense seismic profiling and coring are carried out, it is available to estimate source of tsunami and to reproduce. Very dense marine seisemic profiling and piston coring was held in Beppu Bay during years and damaged historical tsunami occurred in 1596. We estimate source of tsunami accompanied by the 1596 Keicho Bungo earthquake, by using these records. The principle proposed by Shimazaki et.al. in 1986, which examine both how much and when fault moved is used to estimate.

Two remarkble reflecting layers are observable in records of single-channel reflection profile, namely the Akahoya ash layer(about 6700 yrs B.P.) and Yufu ash layer(about 2500 yrs B.P). Because sedimentation rate is larger than average slip rate, all displacement caused by previous events are preserved in submarine. By comparing the cumulative vertical displacement of the Akahoya ash layer with that of Yufu ash layer,the ratio of the displacement of Akahoya divided by Yufu almost become constant. Thus, We concluded that characteristic earthquake model, proposed Schwartz and Coppesmith in 1984, holds for active faults in Beppu Bay. We estimated the vertical offsets of the sea bottom accompanied by the 1596 Keicho Bungo earthquake. We also calculated the initial wave height of the tsunami and carry out numerical simulation of tsunami propagation.

Although both model can't satisfactory explain the maximum wave height by Hatori in 1985 on the basis of historical document, the calculated tsunami height well agrees with observed one along the southern coast of Beppu Bay, where most reriable reports are available. Result of this simulation suggests that not only the Central Beppu Bay Fault but also other fault segments ruptures at the time of the 1596 Keicho Bungo earthquake.