

## Magnitudes of historical intra-plate earthquakes in Tokai area

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Tokai region of Japan increases the possibility of an impending great earthquake due to the Coulomb stresses induced by the 2011 off the Pacific coast of Tohoku Earthquake [Toda et al. (2011)]. If major interplate earthquakes such as the Hoei and Ansei Tokai are excluded from historical damage earthquakes in the Tokai region, we find several intra-slab damage earthquakes in history. Recently, the damage earthquake (M6.4) at the Suruga Bay on August 11, 2009 drew attention as one of intra-slab earthquakes along the area of Niijima-Irozaki-Shizuoka tectonic line. Since a lot of earthquake data including seismometer observations and historical records are available, we try to reevaluate the magnitude of historical earthquakes based on seismic intensity data in order to obtain important findings useful for structure design and earthquake disaster prevention in this region.

The magnitudes of historical intra-slab earthquakes tend to be estimated larger than true value based on seismic intensity data inferred from old documents due to their high-frequency rupture characteristics. We and our collaborated researchers have re-evaluated the magnitudes of historical earthquakes occurring in the subducted slab of the Philippine Sea plate at several areas such as the Akinada and Iyonada (Geiyo) [Takahashi et al. (2008)], the Bungo Channel [Kanda et al. (2008)], and near Kyushu and South-east Islands [Takemura et al. (2009)]. We dealt with intra-slab earthquakes occurring the Tokai region in this study and re-evaluated their magnitude in the same way. We selected six earthquakes as historical intra-slab events in this region, those occurrence date (original magnitude) were 1589/3/21 (M6.7), 1686/10/3 (M7.0), 1841/4/22 (M6.25), 1855/11/7 (M7.0-7.5), 1857/7/14 (M6.25), 1861/3/24 (M6.0) [Usami(2003)]. Though the 1855 event had the possibility of an interplate event as the aftershock of the 1854 Ansei Tokai earthquake, it was assumed to be an intra-slab earthquake just like other events in this analysis.

At first, the seismic intensity attenuation relationship and site correction factors at observation site were estimated using recent measured intensity data of intra-slab events in this region. Secondly, the fault plane for each earthquake was assumed based on the fault mechanism data and other findings of recent major events. Finally, the seismic intensity inversion and forward analysis was carried out to estimate the most adequate magnitude.

The obtained attenuation relationship estimates seismic intensity for earthquakes of M6.5-7.0 in this area lower than those of the intra-slab earthquakes of other area in the subducted slab of the Philippine Sea plate. It shows the difference due to the high-frequency rupture characteristics. We infer that the effect of focal depth may be one of the important factors.

The most adequate magnitudes obtained by the seismic intensity inversion and forward analysis are less than M=6.7 except the 1855 event with the potentiality of an interplate earthquake.

Keywords: seismic intensity, inversion analysis, historical earthquake, high frequency, intra-slab earthquake, magnitude