# Near-Field Ground Motion Simulation based on Depth-Dependent Stress Accumulation Model Ⅱ, Application to 2014 Northern-Nagano Earthquake

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The influence of the depth-dependent stress variation on the rupture behaviour is important aspect for quantitative estimation of ground motions, although this feature has been rarely incorporated into ground motion simulation. Previously, we proposed the assumption that the stress is loaded according to the medium rigidity (Aochi and Tsuda, in revision, 2022). Consequently, stress is loaded only on a limited layer if a 1D structure model is applicable. On the accompanying presentation (Aochi et al., SSJ fall meeting, 2022), we numerically demonstrated the dynamic rupture process through 3D numerical simulations, particularly for the moderate size event, 2019 Mw 4.9 LeTeil (France) earthquake, showing a very shallow ruptured area with ground surface displacement. In this study, we extended this idea by making heterogeneous distribution of model parameters and apply it to the 2014 Northern-Nagano Earthquake (Mw 6.4). First, the depth-dependent stress distributions have been constructed based on the known layered structures derived from adjacent stations. We then allow heterogeneous distribution of dynamic stress level to be consistent with the simple characterised source model containing two asperity areas (Hikima *et al.,* SSJ meeting abstract, 2015). We used the Spectral-Element Method (e.g., Galvez *et al.,* GJI, 2014), reassuring the effective frequencies lower than 0.5 Hz. The resultant slip distribution is shown in Figure 1(a). The maximum slip is 3.8m and resultant moment magnitude considering area with over 0.1m slip as the fault surface is 6.4. We also show slip-rate functions at two typical points on the fault in Figure 1(b). Point 1, located around the edge of the asperity in the shallow, shows a very steep slip-rate function with large amplitude. This steep shape is different from Point 2, which shows a typical slip time function in the numerical simulations, namely a steep onset and the following decay). This fact might have big influence on the mechanism to generate short-period ground motions on the site close to the fault.

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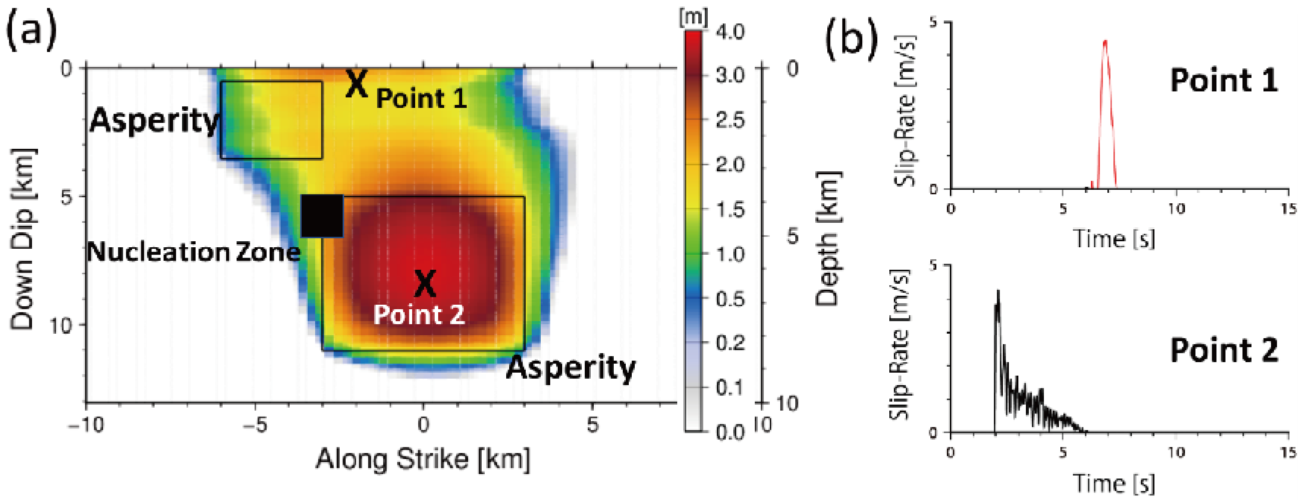


Figure1 (a) Simulated slip distribution based on the characterized source model by Hikima *et al.* (2015) (b) Slip-rate functions at two on-fault points whose positions are illustrated in Panel (a)