Dynamic Rupture Simulations to Study the Behavior of the M7-M8 Class Earthquakes

*samaneh arzpeima[1], Kenichi Tsuda[1], Sachio Ogawa[1], Takahide Watanabe[1], Junichi Miyakoshi[1], Satoshi Iwase[2], Tetsurou Sasaki[2], Satoshi Harada[2], Ampuero J-P[3]

1. Ohsaki research institute,INC., 2. Chubu Electric Power Company, 3. California Institute of Technology

The fault rupture of the 2011 Off the Pacific Coast of Tohoku earthquake (Tohoku earthquake, Mw 9.0) ruptured huge amount of area along the Japan trench, including the area close to the trench, where large slip during the main shock was detected, as well as the Miyagi-Oki area around 30 km deep, which radiated short period energy, and their magnitude is usually M7-M8 class earthquakes, such as the historical Miyagi-Oki earthquakes (1978 and 1937).

The rupture of more than one asperity is a prominent phenomenon seen on the large subduction megathrust earthquakes. Understanding the parameters that control the simultaneous failure of multiple asperities, hence maximum magnitude and slip are very crucial for developing scenarios for the M7-M8 class earthquakes.

In this study, we focused on the behavior of the deep asperities from Tsuda et al. (2017) that host M7-M8 class earthquakes. We have simulated dynamic rupture propagation by varying features of the asperities, like their spacing, depth, and values of stress drop and strength drop. Then we make a comparison between these behaviors and the historical earthquakes, such as 1944 Tonankai (M 7.8) and the 1946 Nankai earthquakes (M8.4).

Keywords: subduction earthquakes, multiple asperities, dynamic simulation, simultaneous failure

