**Japan Geoscience Union Meeting 2011**
(May 22-27 2011 at Makuhari, Chiba, Japan)


MIS036-P53 Room:Convention Hall Time:May 26 14:15-16:15

# How did the 2011 Tohoku Earthquake start and grow up? -Role of dynamic weakening and conditionally stable area-

Yuta Mitsui[1*], Yoshihisa Iio[2]

[1]Sci., Hokkaido Univ., [2]DPRI, Kyoto Univ.

The 2011 Off the Pacific Coast of Tohoku Earthquake broke the huge area from Miyagi-Oki to Ibaraki-Oki. Such the large-scale rupture on the plate interface was the first observation off the Pacific Coast in Japan. Why did such the giant M9-class earthquake occur? To consider its generation mechanism, we construct a preliminary model of the mechanical system of the M9-class earthquake based on geophysical observation.

We consider the generation mechanism of the 2011 Tohoku Earthquake as follows: In the restoration period of the interplate locking after the active period of M7-class earthquakes and afterslip, one M7-class earthquake off Miyagi occurred and triggered the 2011 Tohoku Earthquake as the model proposed by Matsuzawa et al. (2004). Although the rupture initiation was similar to the M7-class earthquakes around this area, certain dynamic-weakening mechanism such as thermal pressurization of pore fluid promoted the rupture propagation. In particular, extremely large slip occurred in the region on the east of the hypocenter without strong wave radiation in short period. Then the rupture propagated southward through a barrier-like region with slower slip velocity and large amount of slip, and extended to the southern part.

As a part of the above scenario, we perform a preliminary simulation using a connected spring-slider system, to present that the extremely large slip in the northern part could cause rupture propagation southward without large-scale nucleation over the whole fault. The slip behavior of the barrier-like region is well explained by the “conditionally stable” condition of frictional instability. Furthermore, we try to show that the thermal pressurization around the hypocenter could cause the extremely large slip within the northern part using a three-dimensional elastodynamic system.

Keywords: Thermal pressurization, Conditionally stable, Earthquake cycle, Giant earthquake