Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG62-P17 Room:Convention Hall Time:May 27 18:15-19:30

Simulation of slow earthquakes affected by tide

KURIHARA, Ryo[1*] ; ANDO, Ryosuke[2] ; YABE, Suguru[2] ; TANAKA, Yoshiyuki[1] ; OBARA, Kazushige[1]

[1]Earthquake Research Institute, The University of Tokyo, [2]Graduate School of Science, University of Tokyo

Slow earthquakes occur at the deeper extension from the seismogenic zone along subducting plate interfaces and may affect occurrence of large earthquakes. Therefore, it is important to understand the physical mechanism of slow earthquakes. On the other hand, the tides are one of important factors that affect slow earthquakes and possibly large earthquakes suggested by Tanaka[2012], who found increasing tidal sensitivity of seismicity toward a large earthquake.

In order to investigate quantitatively the influence of the tides on the recurrence process of earthquakes, we develop a physical model of slow earthquakes with the tidal effects.

In the primary model, we considered a 2-D fault embedded in the elastic half-space, mimicking as a subduction plate boundary. We divide the fault into the shallower coupling area and the deeper decoupling area. The coupling area has a frictional strength obeying the slip weakening law, associated with the velocity strengthening term to simulate slow slip events. The decoupling area obeys monotonic velocity strength, exhibiting steady slip by the tectonic loading and tidal stresses. We consider the following two cases in the tidal stresses: the simplified sinusoidal function that has the constant amplitude and the period, and the realistic case, in which we calculated the amplitude and the phases along the upper boundary of the subducting Philippine Sea plate in western Shikoku area. Both of the Earth and ocean tides are considered. The tectonic loading is assumed as the back slip model. We employ quasi-dynamic boundary element method for the numerical simulations.

As the results, we found that the tides actually modulate the timing of the slow earthquake occurrence. The migration velocity might also be modulated by tides. In addition, we confirmed that slow ”pre-slip” events occur in the small area at the bottom of the coupling area before large slip events, and they are modulated by the tides. The tides also seem to control the stoppage of slip events and further affect the distribution of the residual stress.

Keywords: slow earthquake, tide, source migration