HOKKAIDO UNIVERSITY

Title	Comprehensive Study of the Enhancement of Interplate Coupling in Adjacent Segments after Recent Megathrust Earthquakes [an abstract of dissertation and a summary of dissertation review]
Author(s)	Yuzariyadi, Mohammad
Citation	北海道大学. 博士(理学) 甲第14369号
Issue Date	2021-03-25
Doc URL	http://hdl.handle.net/2115/81975
Rights(URL)	https://creativecommons.org/licenses/by/4.0/
Type	theses (doctoral - abstract and summary of review)
Additional Information	There are other files related to this item in HUSCAP. Check the above URL.
File Information	Mohammad_Yuzariyadi_abstract.pdf (論文内容の要旨)

Instructions for use

Hokkaido University Collection of Scholarly and Academic Papers : HUSCAP

Abstract of Doctoral Dissertation

Degree requested: Doctor of Science Applicant's name: Mohammad Yuzariyadi

Title of Doctoral Dissertation

Comprehensive Study of the Enhancement of Interplate Coupling in Adjacent Segments after Recent Megathrust Earthquakes
（最近のプレート境界地震に続いて隣接セグメントで生じたプレート間固着強化に関する包括的研究）

In general, the concept of a seismic cycle, especially in the subduction zone, consists of three phases: interseismic, coseismic, and postseismic. These three phases can be observed through GNSS observations because these three phases have different directions of motion. During interseismic, all GNSS stations move landward; during coseismic, all GNSS move seaward, and during postseismic, all GNSS move seaward and slowly return to land. During the postseismic phase, the deformation caused by the viscoelastic relaxation results in prolonged seaward movement. Apart from seaward, several previous studies have also found a landward increase of surface velocity in the early postseismic stages, especially in the adjacent rupture segment.

Landward increase of surface velocity has been found for segments adjacent along-strike to megathrust faults after the 2003 Tokachi-oki and the 2011 Tohoku-oki earthquakes, NE Japan. A similar increase of landward velocities was reported for the segments to the north of the rupture of the 2010 Maule earthquake, Chile. I utilize available GNSS data to find such changes for six megathrust earthquakes in four subduction zones, including NE Japan, central and northern Chile, Sumatra, and Mexico to investigate their common features. My study showed that such increase, ranging from a few mm/yr to ~1 cm/yr, appeared in adjacent segments following the 2014 Iquique (Chile), the 2007 Bengkulu (Sumatra), and the 2012 Oaxaca (Mexico) earthquakes in addition to the three cases.

The region of the increased landward movements extends with spatial decay and reach the distance comparable to the along-strike fault length. On the other hand, the temporal decay of the increased velocity is not clear at present. The degree of increase seems to depend on the earthquake magnitude, and possibly scales with the average fault slip in the earthquake. This is consistent with the simple two-dimensional model proposed earlier to attribute the phenomenon to the enhanced coupling caused by accelerated subduction. However, these data are not strong enough to rule out other possibilities.

In addition to the information above, I also investigated the increasing background seismicity rate following the 2011 Tohoku-oki and the 2010 Maule earthquake in the same regions where GNSS stations indicate enhancement coupling occurs. According to Ide (2013), relative plate velocity correlates positively with the seismicity rate. Hence, I hypothesized that the increased background seismicity rate could be found where the relative plate velocity increase. There, I found a moderate increase in seismicity of ~10%, which is smaller than the rate of increase in landward velocity for the two largest earthquakes associated with the increased landward velocities.