Forward simulation of postseismic process after moderate and large interplate earthquakes along the Nankai Trough

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Along the Nankai trough, it has been considered that low seismic activity in the interseismic period is a typical feature there, and that the accumulated strain during the interseismic period is only released by great interplate earthquakes with recurrence intervals of 90-200 years. However, recent observations or studies show that there have occurred several M6~7-class interplate earthquakes within the region of the Nankai Trough earthquake, such as an M6-class earthquake at Kumano-nada (April 1, 2016) and an M7.6 Hyuga-nada earthquake (July, 1498).

Recent two M6~7-class earthquakes occurred within the source area of great interplate earthquakes nearby the Japanese Islands were followed by contracting consequences: the 2016 Kumano-nada earthquake above wasn't followed by the great interplate earthquake, while an M7-class interplate earthquake which occurred at off-Tohoku region in March 9, 2011 was followed by the 2011 Tohoku-oki earthquake, and was regarded as a foreshock of Tohoku-oki earthquake.

Such different consequences are caused by the different urgency of the great interplate earthquake at the timings of occurrences of these M6~7-class earthquakes. Thus, when the occurrence of great earthquake is approaching, postseismic slips after the M6~7-class earthquakes can easily propagate to the surrounding region and can trigger the subsequent great event. While, if the fault is not urgent to the great event, strong coupling on the fault may prevent postsesmic slip from propagating to the surrounding area. These differences in postseismic slip patterns strongly affect the corresponding crustal deformation observed at the earth's surface or the ocean bottom. Hence, from occurrence pattern of the crustal deformation after the M6-7 earthquake in the target source region, it might be possible to narrow down the pattern of afterslip or the subsequent scenario that can occur.

In this study, we focus on the Nankai Trough region, and firstly examine the possible propagation pattern of after slips after the hypothetical occurrence of earthquakes such as M7-class Hyuga-nanda earthquake or M6-class Off-Kumano earthquake in many Nankai Trough earthquake scenarios deduced from numerical simulations. Then, we classify the expected postseismic deformation patterns at the pre-existing observation networks depending on the propagation pattern of particular after slip. Further, we will consider whether the pre-existing network have a distinguishability of after slip propagation pattern or not. If the distinguishability in the existing network isn't enough to distinguish the postseismic slip, we will seek for the better observables or the better observation arrangements. In oder to evaluate realistic crustal deformation, we will evaluate crustal deformation associated after slips not only in a homogeneous elastic half-space but also in FE models with heterogeneous crustal structure and the configuration of bathymetry at the earth's surface.

Keywords: Nankai Trough earthquake, crustal defomation, urgency of the great earthquake

