Spatio-temporal variation in crustal deformation associated with the earthquake cycle at the Nankai Trough

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Megathrust earthquakes at the Nankai Trough are a key issue in Japanese earthquake disaster mitigation. Recently, people are concerned about simultaneous rupture of the Tokai, Tonankai, and Nankai segments because the earthquake size is expected to increase. Also, it is a difficult problem to predict if the next earthquake will rupture multiple segments or not. Earthquake simulations may be useful to tackle these problems, and such techniques have been developed and improved, and we start obtaining a realistic result. However, observational information such as crustal movement and seismicity has not been incorporated in the current calculation yet.

Along the Nankai Trough, geodetic data of leveling as well as triangulation have been accumulated during the last 120 years, a period comparable to the earthquake recurrence interval. We also have continuous GPS data for last 15 years, which provide us with a detailed spatio-temporal pattern of crustal deformation. Based on these observation data, we can estimate seismic as well as aseismic slip distribution on the plate boundary and introduce it to numerical simulations of earthquake generation cycles as boundary conditions.

I will focus on vertical deformation data during the last earthquake cycle, and discuss characteristics of crustal deformation associated with the earthquake cycle at the Nankai Trough. One important feature of crustal deformation is that postseismic deformation continues for tens of years following a main shock. Postseismic deformation after the 1946 Nankai Earthquake is well known. I found similar deformation around the Ise Bay after the 1944 Tonankai Earthquake. Around the Suruga Bay, ground subsidence is not significant until 1920's, which is considered as postseismic deformation of the 1854 Ansei earthquake.