Monitoring of interplate aseismic slip in southwest Japan by Network Inversion Filter

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It has been 30 years since the establishment of the GEONET GNSS network in Japan by GSI. Based on GONET data, many aseismic interplate slip events have been detected in southwest Japan on the plate interface between the overriding Amur plate and the subducting Philippine Sea plate. The mechanism of SSEs and role of these events in subduction processes remain to be elucidated. Furthermore, there are some cases in which SSE triggered a large earthquake nearby in the world. Therefore, the spatiotemporal evolution of SSEs must be monitored and investigated in as detail as possible without so much delay after GNSS data acquisition. For that purpose, we constructed a network inversion filter program set, which processes GNSS position time series to estimate interplate aseismic slip in southwest Japan regularly. The estimated interplate aseismic slip is posted in our website after automatic analysis and visualization.

The result from 2018 shows aseismic slip in several areas occurring in southwest Japan. The latest monitoring in August 2024 for 90 days before the 2024 M_w7 earthquake shows a possible slip downdip of the earthquake, central Shikoku SSE, possible slip in Kii peninsula, and Tokai SSE, which started from 2022.

With regard to the Hyuga-nada earthquake with M_w7.0 on August 8 2024, there is a possibility that SSE occurred from early 2024 before the earthquake in downdip area of the main shock, although it is unclear whether this SSE triggered the main shock. The estimated afterslip in our model reached M_w6.8 until August 23, 2024, although the margin error seems to be 0.2 and large.

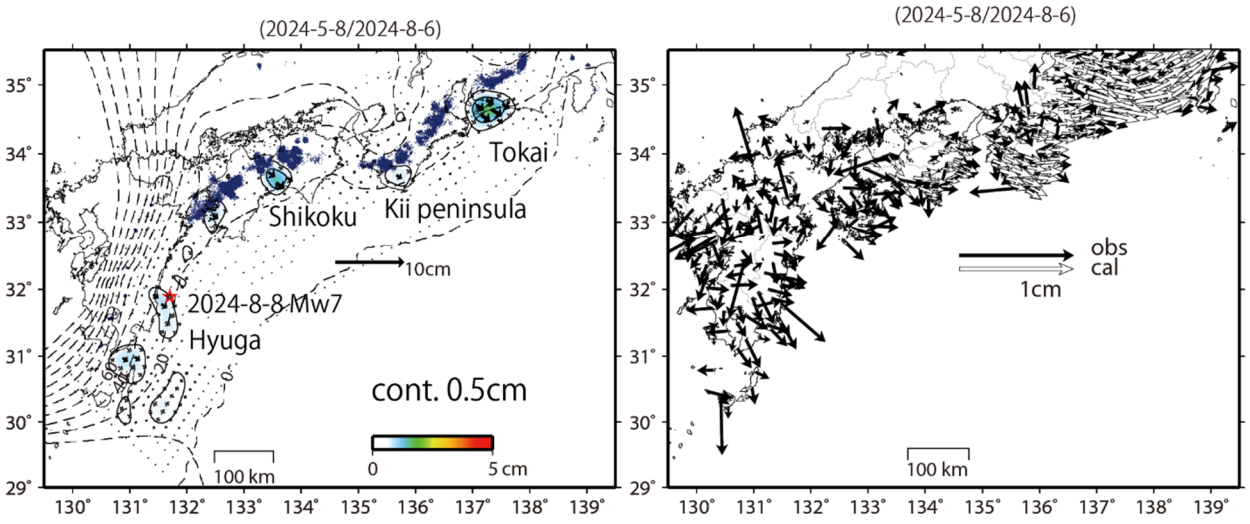
The central Shikoku SSE has been occurring since 2019 with fluctuation in slip speed, amounting to M_w6.6 in August 2024.

Since the area near the tip of the Kii peninsula is thought to be a possible area of initial rupture in several simulation studies and at the time of the 1944 Tonankai earthquake, a possible aseismic slip at the tip of the Kii peninsula needs careful monitoring. It seems to have started from 2020 and reached M_w6.4 in August, 2024.

From 2022, the GNSS sites in Tokai area stared to deviate from steady crustal deformation. Based on these observations, our program shows aseismic slip in Atsumi peninsula since 2022. The total M_w amounts to 6.4 in August, 2024. This SSE indicates that the Tokai SSE which occurred in 2000-2004 and 2013-2016 in the past seems to have a recurrence interval of 10 to 12 years with a duration of 4-5 years.

We are monitoring these SSEs with regular time interval and repot part of the results to the governmental committee on earthquake hazard monitoring.

90 days beofre the 2024 Mw7 earthquake



14 days after the 2024 Mw7 earthquake