Observation of seafloor crustal deformation in the area between Okinawa and Miyako Islands: Primary report

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Tadokoro et al. [2018] reported that the strong interplate locking beneath the two seafloor geodetic sites off the Okinawa Island where the depth of subducting Philippine Sea plate shallower than 12-13 km based on the results of seafloor crustal deformation monitoring. The obtained locked area is consistent to the source of the tsunami event in 1791 which is reported in Nakamura and Kinjou [2013] and located at up-dip side adjacent to the area of active short-term slow slip reported in Nishimura [2014]. However, the lateral extent of the locked area cannot be constrained from the observations at the above two sites.
We installed the other two sites, named RKC and RKD, in the ocean area between Okinawa Island and Miyako Island where the depth of subducting Philippine Sea plate of about 10 km in September 2016 and started to monitor the seafloor crustal deformation. There are no islands in the target area, resulting in a gap of the on-land GNSS observation network. It is, therefore, essential to monitor the seafloor crustal deformation in order to understand the state of interplate locking. The locations and the depths (ellipsoidal heights) of the two sites are as follows:
RKC: 24.9309N, 127.4813E, -3844m
RKD: 24.4619N, 126.9906E, -4090m
We have performed campaign observations three times at RKC on September 29-30, 2016, September 24, 2019, and September 20-21, 2021; and twice at RKC on September 29, 2016, and September 21, 2021. The number of campaign observation is insufficient to derive accurate site velocities. Nevertheless, the time series of the seafloor position shows a clear linear trend at RKC site where has been observed three times every 2-3 years. The tentative site velocities are 21mm/y towards N172W at RKC and 41mm/y towards N136E at RKD with respect to a block between Okinawa Island and Miyako Island. The directions of these site velocities are inconsistent to that of relative plate convergence, and no clear evidence of interplate locking in the target ocean area is derived from our measurements. We are planning to observe at RKD site also in 2022.

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