

Relationship between the interplate quasi-static slip and the focal region of M7-class interplate earthquakes in the Hyuga-nada, SW Japan subduction zone

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Introduction

In the Hyuga-nada region, the Philippine Sea Plate subducts northwestward beneath the Eurasian Plate an approximate rate of 5–7 cm/year, and M7-class interplate earthquakes have repeatedly occurred at decade years interval. Estimating of these focal regions are necessary for understanding the heterogeneous interplate coupling in this region. We relocate the hypocenters of the main shock and aftershocks for the major interplate earthquakes which occurred in 1931 (Mjma7.1), 1941 (Mjma7.2), 1961 (Mjma7.0), and 1970 (Mjma6.7), and compare them with the quasi-static slip rate estimated by the analysis of small repeating earthquakes.

Data and Method

We used the smoked-paper records and the Seismological Bulletin of the Japan Meteorological Agency (JMA). All hypocenters were relocated mainly using S-P time data, and also using P wave arrival time data but the weight was set to one fifth of the S-P time data for reducing the error caused by inaccuracies of the clock. All the main shock events were re-picked the S-P time from the smoked-paper records. We calculated the hypocenter location that minimizes the S-P time and P wave traveltimes residual using Down-hill Simplex algorithm. Because these events were assumed the interplate earthquakes, we fixed the focal depth located on the plate boundary obtained by the ocean bottom seismological observation [Uehira *et al.* (2010)]. Theoretical S-P times were calculated by 3D ray trace with 3D velocity structure model.

Result and Discussion

Fig. 1 shows the result of the relocation of main shock (star) and the estimated focal region (ellipse) from the aftershock distribution. Main shocks were located on the low quasi-static slip area which is consistent with previous study [Yamashita *et al.* (submitted in GRL)]. Focal region of 1931 and 1961 events overlapped, and two asperities for Oct. and Dec. 1996 events were also included in the 1931 and 1961 focal regions. In addition, this region is consistent with the low quasi-static slip rate area. This result indicates that the 1996 events were the “repeated rupture of asperities” with a recurrence interval of 30 ~ 35 years.

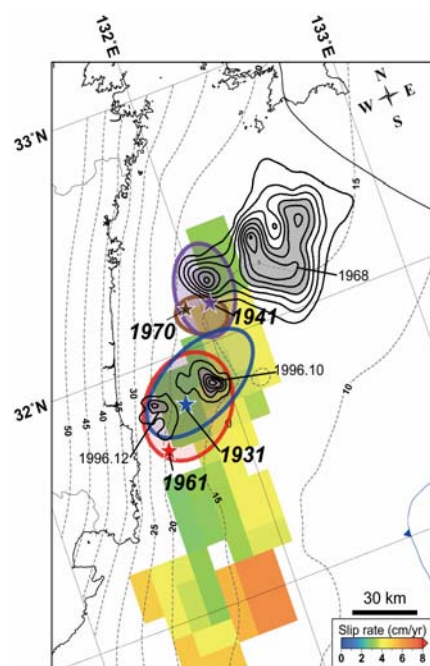


Fig.1 Distribution of the relocated main shock hypocenters (star) and estimated focal regions (ellipse).