Quasi-static slips at SE off Hokkaido, Japan in the last 10 years, estimated from repeating earthquakes

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Off the southeast coast of Hokkaido, Japan, the 2003 Tokachi-oki earthquake (M8.0) took place on September 6, 2003 and a M7.1 event occurred on November 29, 2004. Both of them were located on the plate boundary and their significant afterslips were detected by GPS observations (e.g., Miyazaki et al., 2003; Baba and Hirata, 2004, Yui et al., this meeting). On the other hand, small repeating earthquake data also provides information on quasi-static slips independent of GPS data. Since the small repeating earthquakes are thought to be caused by repeated rupture of isolated asperities (seismic patches) surrounded by aseismic areas, cumulative quasi-static slip around each asperity should coincide with the cumulative slip of repeating earthquakes occurring on the asperity. In this study, we estimated interplate quasi-static slip distributions southeast off Hokkaido by calculating cumulative slip for each repeating earthquake sequence.

The quasi-static slip distribution thus estimated from repeating earthquake data shows low slip rates of around 5 cm/year in this region for the period of about 10 years prior to the 2003 Tokachi-oki earthquake. After the earthquake, significant quasi-static slip accelerations (afterslips) were detected in the regions to the south and east of the 2003 event's asperity estimated by Yamanaka and Kikuchi (2003). The 2004 event of M7.1 occurred at the northeastern edge of the afterslip area of the 2003 event. Then quasi-static slips were again accelerated in the regions surrounding the asperity of the M7.1 event. On December 6, one week after the event, a M6.9 event took place on the south of the M7.1 event. The earthquake sequence and quasi-static slip accelerations mentioned above can be explained by the 'chain reaction model' (Matsuzawa et al., 2004) which was originally proposed to explain the seismic activity off Sanriku.

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