

## Stress drops of earthquakes on the Pacific plate off south-east of Hokkaido, Japan: Implications for the spatial heterogeneity of frictional properties

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We analyzed stress drops of 721 earthquakes with the magnitude of 4.0 to 5.0 off south-east of Hokkaido, Japan and investigated the spatial heterogeneity of the difference of shear strength and dynamic stress level on the Pacific plate. We deconvolved observed P and S waves with those of collocated small earthquakes and derived the source effect of the earthquakes. We then estimated corner frequencies of the earthquakes and calculated stress drops by using a circular fault model. The values of stress drop showed a spatial pattern consistent with slip distributions of historical large earthquakes. This suggests that frictional properties on the plate interface show little temporal change and their spatial pattern can be monitored by stress drops of moderate-sized earthquakes. The spatial heterogeneity would give clues for estimating the slip pattern of a future large earthquake and discussing a policy for the disaster mitigation, especially for regions where slip patterns of historical large earthquakes are unclear.

Keywords: Stress drop, Frictional properties on the Pacific plate, Spatial heterogeneity

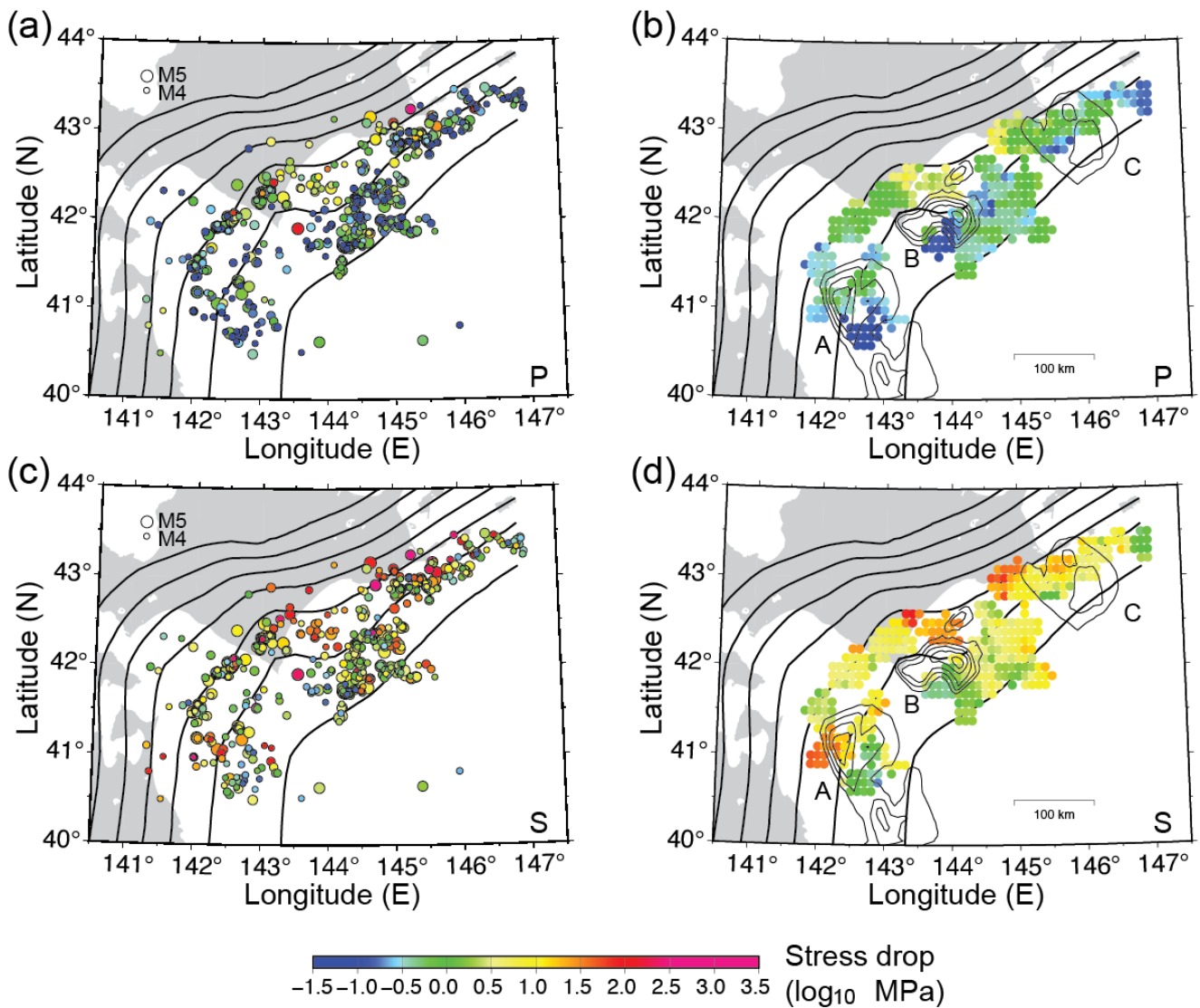


Figure 1. (a) Stress drops for individual earthquakes estimated from P waves. Scale and colour of circles indicate earthquake magnitude and value of stress drop, respectively. Thick lines show the surface depth of subducting Pacific plate (Kita et al. 2010). (b) Spatially smoothed stress drop derived from (a) at grid points with an interval of 0.1 degree in latitude and longitude. A value at each grid point was calculated as an average of stress drops of earthquakes within 15 km of the epicentral distance from the grid point. We did not put any values at grid points with less than four earthquakes within 15 km of the epicentral distance. Thin contours A through C show coseismic displacements for the 1968 Tokachi-oki (Nagai et al. 2001), the 2003 Tokachi-oki (Yamanaka and Kikuchi 2003), and the 1973 Nemuro-oki earthquakes (Yamanaka 2006), respectively with an interval of 1 m. (c) Stress drops estimated from S waves. (d) Map view of spatially smoothed stress drop derived from (c).