

Pre-, Co- and Post-seismic crustal deformation of the 2003 Tokachi-oki earthquake obtained by strain and tilt observation

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The 2003 Tokachi-oki Earthquake with M 8.0 occurred at 4:50 on 26 September 2003. Velocity of Pacific plate relative to Okhotsk plate is estimated from 7.5 to 8.3cm/yr (Wei and Seno, 1998; Sella et al., 2002). The Headquarter of Earthquake Research Promotion earthquake investigating committee had estimated the occurrence probability of the earthquake, Tokachi-oki earthquake, with M8 class at about 60% in 30 years in March, 2003. We present the analysis results of the continuous observation data of strain and tilt currently performed in Hokkaido.

We analyzed the strain and tilt data observed at Erimo observatory (ERM) from January to November, 2003 in order to investigate strain and tilt change before the earthquake. First of all strain and tilt tide are removed by BAYTAP-G (Ishiguro et al., 1981; Tamura et al., 1991). Coefficients of detided strain and tilt at ERM to atmospheric pressure change at Urakawa meteorological station (Japan Meteorological Agency; JMA) are estimated by using a linear relationship. The coefficients are -1.49, -1.59 and -0.62 strain/hPa for strain data and -1.51 and -2.37 rad/hPa for tilt data. These values for strain data are almost same as those estimated by Kasahara et al. (1974). So, we can get strain and tilt change removed tide and effects of atmospheric pressure change. Huge changes, say $5E-7$, are still remained, which seem the effect of rain fall. However, amplitude of the effect of rain fall is not always same to same amount of rain fall. So, the effect of rain fall can not be removed quantitatively.

Co-seismic strain and tilt changes were observed at 12 sites in Hokkaido. We compared observed co-seismic change with calculated change by a single fault model presented by Geographical Survey Institute (GSI). There are a lot of cases that polarities of observed co-seismic change did not agree with calculated one. We calculated co-seismic strain and tilt changes from GPS co-seismic displacement observed by GEONET. We used the co-seismic displacements of three GPS sites just around strain observation site in eastern part of Hokkaido. Almost all polarities of observed are coincident with those calculated from co-seismic displacement change. We concluded that the single fault model should be improved. Post-seismic strain and tilt changes were clearly observed at Urahoro and Akkeshi sites until mid or end of October. Their amplitudes are several micro strain.

The results may be summarized as follows: We examined the pre-seismic strain and tilt change in ERM. Quantitative estimation of the effect of rain fall has not done. So, we cannot conclude there are pre-seismic strain and tilt changes. Polarities of observed co-seismic strain and tilt change are coincident with those calculated from the co-seismic displacement observed by GPS. Post-seismic strain changes were observed in several sites until mid or end of October.