

How much was the interseismic strain released by the 2011 Tohoku-oki earthquake?

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In order to estimate the value of released strain at the 2011 Tohoku-oki earthquake with respect to interseismic accumulated geodetic strain in northeastern Japan, we analyze daily coordinates (F3 solutions) obtained from GEONET, operated by GSI. During the interseismic period, northeastern Japan had been under the EW contractional field with the order of ~ 0.1 ppm/yr, affected by interplate coupling between Pacific plate and Okhotsk plate. On the other hand, the 2011 Tohoku-oki earthquake released these accumulated strain generating mainly EW extensional field. The value ran to several 10 ppm near the hypocenter. We assumed that the period between 1996 and 2002 is interseismic period and its strain rate reflects stable state. Then, we compared this maximum principal strain rate to coseismic released strain toward to interseismic principal strain axis at each area. Around the eastern Pacific coast, the coseismic strain released accumulated interseismic strain of 500-100 years. Back-arc region and northern part of central Japan are released the interseismic strain of 50-100 years and several-several decades by the coseismic event, respectively. In spite of the extensional field at almost all are at the earthquake, some local areas show contraction toward the interseismic principal axes. This is caused by the difference of the direction of interseismic principal axis and coseismic extensional direction, and this may imply a possibility that this strain field change triggered seismic activity in inland after the 2011 Tohoku-oki earthquake. As an example, Yonezawa area in Yamagata prefecture, which is activated seismicity after the 2011 event, became contractional field by the coseismic strain with respect to interseismic principal strain axis. Consideration of this strain change is important to consider the strain accumulation process for the next inland earthquakes in the future. In addition, this geodetic approach will provide independent information to the discussion of stress field change by the seismological data.