

Strain anomalies induced by 2011 Tohoku earthquake observed by means of a dense GPS network in NE Japan

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We evaluated an anomalous crustal strain in the Tohoku region, northeastern Japan associated with a step-like stress change induced by the Tohoku earthquake (Mw 9.0) that occurred off the northeastern Japanese coast in 2011. The source area of the event was extremely large. Hence, the gradient of the observed eastward coseismic displacements at GPS stations had a relatively uniform EW extension in northeastern Japan, suggesting that the induced stress change in this area was uniform. Accordingly, anomalies in the coseismic crustal strain change should reflect the inhomogeneity of rheological crustal characteristics. The deformation anomaly was depicted by subtracting the crustal deformation, which was calculated with a coseismic source model, consisting of two rectangle faults estimated by the observed crustal deformation. The difference in the EW extension anomaly in the forearc and backarc regions possibly indicates a dissimilarity of stiffness, depending on the crustal structure of the Tohoku region. The EW extension in the Ou-backbone range, a strain concentration zone in the interseismic period, was smaller than the predicted extension. This evidence suggests the hypothesis that the viscosity of the lower crust beneath this region is low.