Elasto-plastic behavior of the concentrated deformation zone based on baseline strain rates

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Along the Japan Sea coast of central-northeasth Japan, a concentrated deformation zone was identified based on GPS observation and named as the Niigata-Kobe Tectonic Zone (NKTZ) (Sagiya et al., 2000). Meneses-Gutierrez and Sagiya (2016) found inelastic deformation occurs within NKTZ through a comparison of preseismic and postseismic deformation of the 2011 Tohoku-oki earthquake. In order to achieve higher spatial resolution of the inelastic deformation and to better understand mechanical properties of NKTZ, we conduct a baseline analysis of GNSS data. By comparing the linear strain rates for the neighboring two baselines in a similar direction, we can obtain a plot representing possible effects of inelastic deformation. From the data plot for two baselines, one across and the other outside the NKTZ, strain rates for the two baselines are proportional each other under extension after 2011. On the other hand, under contraction before 2011, strain rates in NKTZ shows almost a constant value regardless of the strain rate outside. The result implies that the NKTZ behaves as an elasto-plastic body and yielding occurred before 2011. These observations provide a new opportunity to resolve inelastic behavior of the Japanese island arc crust.

Keywords: elasto-plastic behavior, concentrated deformation zone, baseline strain rate

