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Characteristics of crustal deformation style of inland Japan deduced from dense GPS observation

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We have been investigating detailed crustal deformation around active fault zones in central Japan to understand the tectonic loading and inland deformation processes. Based on these GPS observation data, the short-term geodetic deformation rate is equal to the long-term geologic deformation rate in some cases, but in most cases, a few times as large as the long-term rate. The difference in deformation rates depends on how we obtain those estimates. Geodetic estimates are based on the measurement of crustal movement over a wide area. On the other hand, geologic estimate is usually based on on-site measurement at the fault trace. So we also have to take the earthquake cycle deformation of the surrounding crustal blocks into account. That is, if all the distributed interseismic strain concentrates on the fault at the time of an earthquake, both data should be consistent each other. Contribution of inelastic deformation becomes negligible in this case. The situation around the Gofukuji Fault and plate boundaries where there is distinct strength difference between the fault plane and the surrounding media. On the other hand, it is highly possible that a significant portion of inland deformation is inelastic and earthquakes at active faults release only a part of accumulated strain. It is suggested based on such discussion that contribution of off-fault inelastic deformation to the inland earthquake cycle needs to be quantitatively discussed for evaluating long-term seismic activity in the inland area. Inconsistency between geodetic and geologic deformation rate provides a clue to quantitative estimate for that.

Keywords: crustal deformation, GPS, slip rate, active faults, stress accumulation, inelastic deformation