Persistent and time-dependent characteristics of crustal deformation in the Central-Northern Nagano area associated with the 2011 Tohoku-oki and the 2014 Northern Nagano earthquakes

*熊谷 光起[1]、鷺谷 威[1,2]、Meneses Angela[3]、張 学磊[1]、松多 信尚[4]、廣内 大助[5]、松廣 健二郎[6]、奥田 隆[6]
*Koki Kumagai[1], Takeshi Sagiya[1,2], Angela Meneses-Gutierrez[3], XUELEI ZHANG[1], Nobuhisa Matsuta[4], Daisuke Hirouchi[5], Kenjiro Matsuhiro[6], Takashi OKUDA[6]

1. 名古屋大学大学院環境学研究科、2. 名古屋大学減災連携研究センター、3. 京都大学防災研究所、4. 岡山大学教育学研究科、5. 信州大学教育学部、6. 名古屋大学地震火山研究センター
1. Graduate School of Environmental Studies, Nagoya University, 2. Disaster Mitigation Research Center, Nagoya University, 3. Disaster Prevention Reserch Institute, Kyoto University, 4. Graduate School of Education, Okayama University, 5. Faculty of Education, Shinsyu University, 6. Earthquake and VolcanoReserch Center, Nagoya University

The Itoigawa-Shizuoka Tectonic Line (ISTL) in central Japan is one of the major active fault system in Japan. Along the northern and central ISTL, there exist many active faults such as the Kamishiro fault, the East Matsumoto Basin fault and the Gofukuji fault. In 2014, Mj 6.7 Northern Nagano Earthquake occurred at the Kamishiro fault. The possibility of occurrence of large earthquake along ISTL is estimated as large as15-30% (HEPP, 2015). So it is important to monitor tectonic strain accumulation and to propose fault models of future earthquakes.
Recent studies suggested inelastic deformation in the crust plays an important role in tectonic loading of intraplate faults. Meneses-Gutierrez and Sagiya (2016) identified localized inelastic deformation in the Niigata region through a comparison of interseismic and postseismic crustal deformation associated with the 2011 Tohoku-oki earthquake. It is of great importance to know how the crustal deformation and tectonic loading is occurring around ISTL while postseismic deformation of the 2011 Tohoku-oki earthquake continues in a large scale. For such a purpose, we conduct dense GNSS observation around the central and northern ISTL. Based on GNSS daily solutions from December 2013 to November 2017, we calculate average horizontal velocity at each GNSS site and compare them with those before the 2011 Tohoku-oki earthquake (Teratani et al. 2014). We also calculate and compare the strain rate before and after the Tohoku-oki earthquake.
We find no significant change in the strain rate pattern around the Gofukuji fault. The result suggests that tectonic loading of the Gofukuji fault or the aseismic creeping below the fault is persistent regardless of elastic perturbation due to the 2011 Tohoku-oki earthquake postseismic deformation. On the other hand, accelerated NW-SE contraction is found around the East Matsumoto Basin fault and the Western Nagano Basin fault. In particular, the change is remarkable in Saigawa Hills located east of the East Matsumoto Basin fault. We also divide the time period after the 2011 Tohoku-oki earthquake by the occurrence of the Northern Nagano earthquake in November 2014. The contraction of Saigawa Hills was further accelerated after the Northern Nagano earthquake and the contraction rate increased by a factor of 1.5~2 by both the 2011 and 2014 earthquakes. We summarize GNSS observation data and discuss their possible implications, with special foci on the aseismic crustal faulting and surface geology.

キーワード：GNSS、糸魚川静岡構造線、長野盆地西縁断層、余効変動、非弾性変形
Keywords: GNSS, Itoigawa-Shizuoka Tectonic Line, Western Nagano Basin fault, postseismic deformation , persistent inelastic deformation

