Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SCG68-08 会場:303 時間:5 月 23 日 16:15-16:30

島弧地殻はどこまで弾性的か？
How elastic is the island arc crust?

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The earth’s crust is usually treated as elastic in the many studies. The term elasticity refers to a physical property of materials that recover their original shape after they are deformed. The elastic theory is very useful in data analysis and interpretation in seismology and geodesy. On the other hand, elasticity of the crust is nothing but a first order approximation. It has not been thoroughly tested in which time scale, in which spatial scale, and to what extent the crust is elastic. These issues have important implications associated with tectonic loading of crustal faults, evaluation of seismic potential, and topographical as well as geological structure development. As an example, we have found that there is significant inconsistency between geodetic and geologic deformation rates around active fault zones in central Japan such as the Atotsugawa Fault and the Itoigawa-Shizuoka Tectonic Line. Geodetically estimated fault slip rate is larger than geologic estimates by a factor of 2 to 3 there. Such an observation strongly suggests that there exists significant amount of inelastic deformation, and a large part of the inelastic deformation should be accommodated within the crustal blocks. Currently available geologic data about crustal strain rate are mostly related to fault offset and do not take deformation of the whole block into account. Thus it is important to develop appropriate methods to estimate long-term deformation rate of crustal blocks. One possibility is to examine cumulative deformation of strata based on seismic exploration and boring. Another possibility is to translate seismological properties such as attenuation and/or scattering coefficient into inelasticity. These possibilities should be investigated and derived results should be integrated into comprehensive modeling of deformation process of the Japanese island arc.

キーワード: 島弧地殻, 弾性変形, 塑性変形, ひずみ速度, 地震発生ポテンシャル
Keywords: island arc crust, elastic deformation, plastic deformation, strain rate, seismic potential