Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)


SSS33-P04 Room:Convention Hall Time:May 22 17:30-18:30

# Stress accumulation pattern in the Kanto region, Japan, computed with the collision model of the Izu-Bonin arc obtained

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The Kanto region of Japan is in a highly complex tectonic setting with four plates interacting with each other: beneath Kanto, situated on the Eurasian and North American plates, the Philippine sea plate subducts and the Pacific plate further descends beneath the North American and Philippine sea plates, forming the unique trench-trench-trench triple junction on the earth. In addition, the Izu-Bonin (Ogasawara) arc on the Philippine sea plate is colliding with the Japan islands due to the buoyancy of the arc crust. In this study, we construct the model of the collision of the Izu-Bonin arc from the constraint of the long-term deformation data in Kanto, and using this model we estimate the stress accumulation pattern in the Kanto region.

In Kanto, we can observe one of the most active crustal deformations on the earth. In the southern part of the Boso peninsula to the south, the uplift rate is estimated to be 5 mm/yr from the height of marine terraces. From geological evidence, the Kanto mountains to the west are considered to uplift at 1mm/yr. In contrast, the center part of the Kanto region is stable or subsiding, covered by the Holocene sediments. The depth of the basement reaches 3 km at the deepest. Vertical deformation in the timescale of 1 Myr is being revealed by the analysis of the recent seismic reflection experiments compared with the heights of the dated sediment layers exposed on land.

To reveal the crustal deformation under these plate-to-plate interactions, we use the kinematic plate subduction model based on the elastic dislocation theory. This model is based on the idea that mechanical interaction between plates can rationally be represented by the increase of the displacement discontinuity (dislocation) across plate interfaces. Given the 3-D geometry of plate interfaces, the distribution of slip rate vectors for simple plate subduction can be obtained directly from relative plate velocities. In collision zones, the plate with arc crust cannot easily descend because of its buoyancy. This can be represented by giving slip-rate deficit.

Using the above model, we estimate the long-term slip-rate distribution due to plate subduction/collision to explain the crustal deformation in Kanto obtained from geological and geomorphological studies. The basic deformation pattern of the basin-forming movement in the Kanto plain and uplifts in the southern Boso peninsula and in the Kanto and Akaishi mountains cannot be explained by the collision restricted to the Izu peninsula only. It is necessary to assume wider collision extended to the neighboring Sagami and Suruga trough, which is consistent to the width of the arc crust of the Izu-Bonin arc.

Using this model, we estimated the stress accumulation pattern in the interior of the plate. The result shows the NW compression under the Kanto rage, collided by the Izu-Bonin arc, and NW tension in the north Tokyo Bay and strike slip in the seaside of Philippine sea plate, which is consistent with the f-net mechanisms.

Keywords: Stress field, Simulation of tectonic evolution, Crustal deformation, Kanto, Izu-Bonin arc, Collision