

A Model with Rigid Rotations and Slip Deficits for the GPS Derived Velocity Field in Southwest Japan

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In order to know kinematic tectonics of southwest Japan, GPS derived velocity field is analyzed. It consists of two factors; the one is the elastic deformation caused by slip deficits on the locked portion along the block boundary, and the other is rigid motion of regional tectonic blocks (or plates).

Therefore rigid motions cause significant errors to the estimation for slip deficits. For example, the velocity field in southwest Japan cannot be fully explained only by a model with slip deficits. Residuals in such model imply the influence of E-W collision between southwest Japan and northeast Japan and the backarc spreading along the northern extension of the Okinawa trough.

We interpret the velocity field in southwest Japan by a superposition of the elastic deformation caused by slip deficits and rigid motions. Based on strain rate field and crustal seismicity, we apply a model with 3 blocks (Inner Arc, Outer Arc, and the northern Ryukyu) and slip deficits along the block boundaries.

Some interesting features of southwest Japan are revealed:

- (1) westward motion of the outer arc relative to the Amurian plate and the inner arc,
- (2) southward motion of the northern Ryukyu block relative to the Amurian plate,
- (3) small right lateral slip deficits along the boundary at the latitude 32(deg)N in southern Kyushu,
- (4) small left lateral slip deficits along the Median Tectonic Line and the Beppu-Shimabara Graben,
- (5) slip deficit rates on the plate interface smaller than in the case that rigid rotations are not considered,
- (6) clockwise deflection of the direction of slip deficits from that estimated in the case that rigid rotations are not considered.