Modeling of Crustal Deformation around Kyushu using GPS Data -Simultaneous Estimation of Interplate Coupling and Block Rotation-

Kayo Miyao[1]; Satoshi Miura[1]; Laura Wallace[2]; Shigeru Nakao[3]; Akira Hasegawa[1]

[1] RCPEV, Graduate School of Sci., Tohoku Univ.; [2] GNS, NZ; [3] Kagoshima Univ.

Site velocities obtained at the GEONET stations shows that the crustal deformation in Kyushu is not uniform, but looks divided into three regions; northern, middle and southern. Mid-Kyushu is moving westward and Southern Kyushu is moving southeastward relative to Northern Kyushu. Studies on interplate coupling beneath the Hyuganada region off southeast of Kyushu and those on block rotation of Ryukyu Arc have been done independently. However, a new method devised by McCaffery [2002] to estimate simultaneously both slip deficit and block rotation have been applied to the west coast of North America, New Zealand, and so on to clarify the active tectonics in those areas. We apply this method to interprete the complex tectonics in and around Kyushu.

Kyushu is located at the northern end of the Okinawa Trough, which may be connected to the Beppu-Shimabara Graben. Mid-Kyushu is characterized by NS extensional strain caused by the graben. Paleomagnetic studies shows that Southern Kyushu have rotated about 30 degrees counterclockwise in the last 2Ma. Bird [2003] defined the arc from Southern Kyushu to Taiwan bounded by the Okinawa Trough and the Ryukyu Trench as the 'Okinawa plate' considering hypocenter distribution and GPS velocities.

Based on these studies, we regard the Beppu-Shimabara graben as a block boundary between Northern and Middle Kyushu. The former belongs to the Amur Plate (AM). We also adopt the boundary of the Okinawa plate (ON) by Bird [2003], which Souther Kyushu belongs to. In addition we named the area between AM and ON as 'Mid-Kyushu block' (MK). The Philippine Sea Plate (PS) is subducting beneath AM, MK, and ON. Block boundaries are treated as vertical faults.

We put dislocation nodes along iso-depth contours on these plate/block boundaries, and then estimated the coupling coefficients at each node on the subducting slab and the slip deficit rates on the block boundaries. The locations of the Euler poles and those angular velocities of ON and MK relative to AM are estimated simultaneously using DEFNODE program [McCaffrey, 2002]. The data used in the analysis is the GPS site velocities obtained from GEONET.

The preliminary results show the larger slip deficit of the subducting slab in the northern Hyuganada and the smaller one in the southern Hyuganada. The Euler poles of AM-ON and AM-MK were located at 135 deg. E, and 32 deg. N with angular velocity of 2.5deg/Ma and at 34 deg. E, and 23 deg. N with angular velocity of 0.2deg/Ma, respectively. The AM-ON angular velocity obtained in this study is 1/6 of that estimated by Kodama[1995] and shows fair agreement. It is necessary to perform more detailed analyses adding more data from the Nansei Islands and Shikoku.