

## The tectonic background of the 2016 Kumamoto Earthquakes across middle Kyushu, the junction of southwest Japan Arc and the Ryukyu Arc

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The 2016 Kumamoto Earthquakes have been occurring across Mid-Kyushu, the junction of the SW Japan Arc and the Ryukyu Arc. Tectonic elements of both arcs therefore should be taken in account for our understanding of the tectonic background of the earthquakes. In this study, the roles of tectonic elements of the SW Japan Arc and the Ryukyu Arc in the tectonics of Kyushu were estimated using geodesic observations (GEONET, GSI), anisotropy of  $V_s$  in the uppermost mantle (Shimizu, 1992) and geological structures of Kyushu.

Horizontal displacements of Kyushu with respect to Genkai, Saga at the back arc coast in northwest Kyushu were examined. On this projection, observation points around Kumamoto migrate west-southwestward. The migration directions rotate counterclockwise to turn southwestward at the south of Kumamoto. The directions of horizontal displacements are similar to those of major tectonic lines such as the Usuki-Yatsushiro Line and the Butsujo Line. Anisotropy of  $V_s$  in the uppermost mantle (Shimizu, 1992) is also oriented to an NE-SW direction around Amakusa and Shimabara. The directions of horizontal migrations significantly change on a line connecting Hokusatsu, Kirishima and Nichinan, striking to the NW-SE direction. The part of Kyushu at the south of this line migrates southward. At Hokusatsu, the Butsujo line changes its direction from NE-SW to N-S, which is called "the Hokusatsu Bend". The horizontal displacements with respect to Genkai therefore are consistent with geological and seismological observations of Kyushu, which indicates that the projection would represent the tectonics of Kyushu. Around Kumamoto, the Futagawa Fault, one of the earthquake source faults, is oriented to an NE-SW direction, whereas horizontal displacements are oriented to west-southwestward, which would have accumulate horizontal compressive stress created by the strike-slip activity of the fault to cause the earthquakes. The SW Japan Arc, such as the Chugoku-Shikoku district migrates northwestward. On the other hand, the Ryukyu Arc migrates southward. The southward component in horizontal displacements of Kyushu therefore represents the deformation element of the Ryukyu Arc. The conjunction of the northwestward deformation element of the SW Japan Arc and the southward deformation element of the Ryukyu Arc would create complex tectonics in Kyushu. The oblique relationship between zonal geological structures and horizontal displacements would make the tectonic of Kyushu more complicated.

The direction of horizontal displacements rotates counterclockwise at the south of Kumamoto, which indicate that not simple strike-slip tectonics but "rotation tectonics" occurs there. Nichinan in southeast Kyushu, horizontal displacements there are relatively small, is the pivot of this rotation. Bathymetric features (Okino, 2015) and seismic observations (Nishizawa et al., 2009) indicate that the subducting Kyushu-Palau Ridge would extend there and obstruct the southward migration. The subducting Kyushu-Palau Ridge therefore would be one of important factors of the rotation tectonics in Kyushu.

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