

## The Quaternary tectonics of central Kyushu and the 2016 Kumamoto earthquake: from a multifaceted viewpoint of geology, seismology, and geodesy

\*Kiyokazu Oohashi<sup>1</sup>, Makoto Otsubo<sup>2</sup>, Satoshi Matsumoto<sup>3</sup>, Kenta Kobayashi<sup>4</sup>, Katsushi Sato<sup>5</sup>, Takuya NISHIMURA<sup>6</sup>

1. Graduate School of Sciences and Technology for Innovation, Yamaguchi University, 2. Geological Survey of Japan, AIST, 3. Faculty of Science, Kyushu University, 4. Department of Geology, Faculty of Science, Niigata University, 5. Graduate School of Science, Kyoto University, 6. Disaster Prevention Research Institute, Kyoto University

The 2016 Kumamoto earthquake occurred in the tectonically complex central Kyushu area where several forcing factors such as the subducting Philippine sea plate, the Median Tectonic Line and the Nankai forearc sliver, the spreading Ryukyu trough, and the migrating volcanic front are involved. In this paper, we revisit the Neogene–Quaternary tectonics of central Kyushu through the integration of geological, seismological, and geodetical approaches. Also, we establish deformation histories of the Futagawa and Hinagu fault zones, source faults of the Kumamoto earthquake, in an attempt to explain the relationship between geologic structures and rupture processes of the earthquakes. Results show that the present-day tectonics surrounding central Kyushu is considered to have been originated in the last 1 Ma or younger, as a transtensional tectonic zone (the Central Kyushu Shear Zone) characterized by combined dextral faults and rift zones (or volcanoes). Reflecting the spatiotemporal variation of the crustal stress field and rift activity, the Futagawa and Hinagu fault zones show a multi-stage deformation throughout the Neogene–Quaternary periods; normal faulting to dextral faulting for the Futagawa fault zone and sinistral to dextral faulting for the Hinagu fault zone. Those diverse histories on stress and strain fields in central Kyushu possibly lead to the complexities of fault geometry and rupture process of the Kumamoto earthquake.

Keywords: Futagawa-Hinagu fault zone, Beppu-Shimabara graben, Okinawa trough, Median Tectonic Line, Philippine sea plate, transtensional tectonics