Brittle shear zone exposed on the coast near Otachi Cape of southern part of Kumamoto Prefecture and geological structure around it

*Keiji Ogashiwa[1]

1. Niigata University

The maximum foreshock observed the maximum seismic intensity 7 of the 2016 Kumamoto earthquake is said to be due to the activity of the northernmost part of the Hinagu fault zone extending about 81 km in the NE - SW direction.

The Hinagu fault zone dies in the Yatsushiro Sea from the southern end of the Yatsushiro plain, and runs parallel to the coast to Otachi cape. It is regarded as a right lateral shift including the eastern uplift. On the other hand, a brittle fracture zone has been reported in the Higo metamorphic rock distribution area, the central axis of the fracture zone shows right lateral shift and the outer rim shows left lateral shift (Kobayashi ·Ogashiwa, 2017). From these facts, it is conceivable that there was a change in the movement.

On the coast near Otachi cape, there is a report that there is a outcrop where the actual status of the Hinagu fault appears (Matsumoto ·Kanmera, 1964). Here, lower Cretaceous Hinagu formation undergoes deformation to form a brittle shear zone, and this brittle shear zone is considered to record motion since the Cretaceous. Therefore, for the purpose of clarifying the transition of the movement of the Hinagu fault after the Cretaceous, basic description and analysis of the brittle shear zone and ground surface survey around the brittle shear zone were carried out.

The average of the attitude of the fault plane measured in the brittle shear zone is N21 °E75 °SE, which is somewhat oblique to the general trend of the Hinagu fault zone. In addition, a tendency toward NS strikes was observed in the west of the brittle shear zone. The eastern side of the brittle shear zone is in contact with non-deformed mudstone. Although the boundary of the western side of the brittle shear zone can not be confirmed because it is submerged in the sea, non-deformed alternating layer of sandstone and mudstone appears further in the west, so the width of the brittle shear zone was considered to be 100 to 150 m.

In the western part of the brittle shear zone, the continuity of the alternating layer of sandstone and mudstone is relatively good, so deformation is considered to be weak. In the eastern part, the mudstone part of the alternating layer of sandstone and mudstone becomes the substrate and the torn sandstone part arranges in the P foliation shows the production of the cataclasite. Furthermore, at the eastern margin of the brittle shear zone, it shows the occurrence including fine grained particles well polished in the black substrate, so the eastern margin was considered to be the deformation convergent belt.

Composite surface structures in the brittle shear zone all show right lateral shift, and many line structures sink to the south from low angle to high angle. Observation of the fault rock specimen reveals that it is a right lateral shift including the western uplift.

Stress analysis using multiple inverse method (Yamaji, 1999) showed ENE-WSW compression and WNW-ESE tensile.

In the vicinity of the brittle shear zone, the Hinagu formation of the northeast strike west inclined orthorotic layer is distributed. On the east side, the Kawaguchi formation of the northeastward Oriental incline reversal layer is distributed and structurally greatly different from the Hinagu formation, so roughly N35 ˚E strike fault is estimated between the Hinagu formation and the Kawaguchi formation. In addition, several confined folds with short wavelengths were confirmed around this estimated fault and brittle shear zone. The direction of the fold axis obliquely intersects the strike of the estimated fault and the brittle shear zone. These folds are considered to be folds formed by the motion forming the estimated fault and the brittle shear zone, because it is not observed except around the estimated fault and the brittle shear zone. The direction of the fold axis oblique with the direction of the estimated fault and brittle shear zone is considered to be the structure showing the P foliation of left lateral shift.

Keywords: Hinagu fault