

Estimation of crustal strength using residual strain of quartz in deformed conglomerate and inhomogenous strain of conglomerate layer -As an example of multiple collision zone of Izu-Bonin arc, Fujikawa valley, Central Japan-

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South Fossa Magna is understood as a site where the Izu-Bonin arc on the Philippine Sea plate collides with Honshu arc, and it is the only arc-arc multiple collision zone in the world. Maruyama (2008) reported deformed conglomerate outcrop accompanied by cataclastic flow in the Hamaishidake Formation (late Miocene to Pliocene). Report of them in the collision zone is not limited to the Fujikawa area, but from the Ashigara Group and from the Erimo Formation in the Hidaka collision zone of Hokkaido (Uda, 1976), have been reported. In this study, various analyzes were performed on deformed conglomerates found in the Fujikawa area, and the cause (temperature / pressure condition) and the position in the collision zone were clarified, it aimed to restrict the multiple collision phenomenon and the deformation environment of trench fill sediments.

[Outcrop outline]

It is revealed that the deformed conglomerate outcrops occurred in the geologic body (Fujikawa Shear Zone) which makes a high dip zone in the direction of NW-SE, and they are modifying the initial NS system folding. The long axis direction of the gravel showing N40W trend and the shear fabric of the gravel showing sinistral sense.

[Paleo stress analysis by multiple inverse method]

The result of the MIM analysis (Yamaji et al., 2011) using the slip data of the gravel fault plane with the flow deformation mode shows ENE-WSW compression, which is not consistent with the current Philippine Sea plate motion.

[Restrictions on forming environmental condition of deformed conglomerate]

We tried to guess the maximum heat temperature of the geological body using the carbonaceous material Raman spectrum (Kouketsu et al., 2014), and examination of the differential stress level using the internal strain of the quartz (Takagi et al., 1988). As a result, it is revealed that deformed conglomerate outcrops heated only 150°C or less, and the maximum heated temperature is rising toward the lower formation of Hamaishidake Formation. When the geothermal gradient is estimated by layer thickness conversion, the value such as 4~5°C / 100 m is restored, and the depth at which the 150°C heating can be recorded is about 3~4 km. That is, the deformed conglomerate is found to be a product under shallow and low temperature conditions. On the other hand, the estimated differential stress value is 50-100 MPa, which is strongly deformed despite being a shallow deformation.

[Discussion]

As for the ENE-WSW compression obtained from cataclastic flow slip data, it can not be explained with only the motion of the Philippine Sea plate. If these as deformation events after the deposition age limit (about 5 Ma) of the Hamaishidake Formation, it is necessary to consider the influence of E-W compression from around 3 Ma (Takahashi, 2006) or the ENE movement of Amur Plate (Komatsubara, 2015), and it

means that the tectonics are not only dominated by the Philippine Sea plate. Considering trench fill sediment objects in the Fujikawa Valley as accretionary bodies, since deformed conglomerate occurs near the boundary fault of the middle and upper strata of the Fujikawa Group, it may be a deformation near the Mega Splay Fault branching from the plate boundary fault at the Tanzawa block collision stage. In addition, considering the usual crustal strength (Byerlee, 1978), theoretically it is not possible to record a differential stress value of 100 MPa at 4 km underground. However, according to the data of drilling at the plate boundary Nankai Trough (Hamada et al., 2018), it is pointed out that the differential stress value rises in the Accretionary prism and reaches nearly 100 MPa. In other words, in the geological body near the plate boundary, it is predicted that the crustal strength is large and it is placed in the high differential stress state also in the subsurface shallow part, and the deformed conglomerate is considered to be a product in such a place.

Keywords: South Fossa Magna, Multiple collision zone, Deformed conglomerate, Rheology of fault rocks