Fracture zone structure of the Atera Fault in Kawaue, Nakatsugawa City, Gifu Prefecture

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The Atera Fault in the eastern part of Gifu Prefecture is a NW-trend active fault (Class A) and shows sinistral strike-slip displacement. Fracture zone of the Atera Fault, in which the Naegi-Agematsu Granite is in fault contact with the Gero Ash-flow Sheet of the Nohi Rhyolite, is exposed several tens meters in width in Kawaue, Nakatsugawa City. In this study, detailed occurrence of the fracture zone is described to examine the research method to reveal histories of active faults.

The studied fracture zone is divided into Zones 1 to 6 from west to east on the basis of lithology and mode of occurrence. The Zone 1 consists of massive welded tuff with cracks, which extends to 15 m or more in width. The Zone 2, which is approximately 15 m in width, consists of welded tuff breccia of several millimeters to tens centimeters in size and gray clay derived from welded tuff. A size of the breccia decreases eastward in the Zone 2, while a proportion of the gray clay increases eastward. The Zone 2 displays a gradational contact with the Zone 1. The Zone 3, which is approximately 1.2 m in width, consists of gray, black, white and cream clay derived from welded tuff with pebbles of welded tuff and granite. Lenticular pebbles are associated with asymmetric tails indicating sinistral sense of shear. The Zone 3 is in sharp fault contact with the Zone 2. The fault strikes NW and dips steeply S. The Zone 4, which is approximately 0.3 m in width, consists of gray, black and white clay derived from granite with granite pebbles. A glassy black vein of 4 cm in thickness occurs along the boundary between the Zones 3 and 4. Fragments of quartz, feldspar and clinopyroxene are abundantly included in the vein. The Zone 5 consists of granite cataclasite and extends to 4 m or more in width. The Zone 5 is in sharp fault contact with the Zone 4. The fault strikes NW and dips steeply S. A branched and dragged black vein develops in the 30 cm east of the fault between the Zones 4 and 5. The vein includes fragments of quartz, feldspar and biotite in a dark brownish clay-rich matrix. Another fault showing a NW strike and steep S dip occurs in the 1 m east of the fault between the Zones 4 and 5. The fracture zone of the fault, which is approximately 30 cm in width, consists of gray clay with pebbles of granite and welded tuff. The Zone 6 consists of massive granite with cracks, which extends to 10 m or more in width.

In the Zones 2 to 5, composite planar fabric of P foliation, Y shear and R1 shear develops in meso- and microscale, indicating sinistral sense of shear. The Y shear strikes NW and dips steeply S or N. Clay minerals are aligned along the P foliation.

Based on the XRD analysis, clay minerals in the Zones 2 to 5 are composed mainly of smectite, chlorite and illite, while those in the 30-cm-wide fracture zone in the 1 m east of the contact between the Zones 4 and 5 are composed of kaolinite and smectite.

The black veins along the boundary between the Zones 3 and 4 and in the 30 cm east of the contact between the Zones 4 and 5 can be formed due to fault activity, on the basis of their deformation. The fault in the 1 m east of the contact between the Zones 4 and 5 can show epigenetic activities near the surface, from the viewpoint of its occurrence and clay mineral composition.

Textures of host rocks are almost entirely broken in the Zones 3 and 4, and the eastern margin of the Zone 2. Fault rocks derived from the welded tuff include more clay-rich than those from the granite. In the studied fracture zone, the difference of host rocks can be involved with the degree of cracking and fault clay formation.

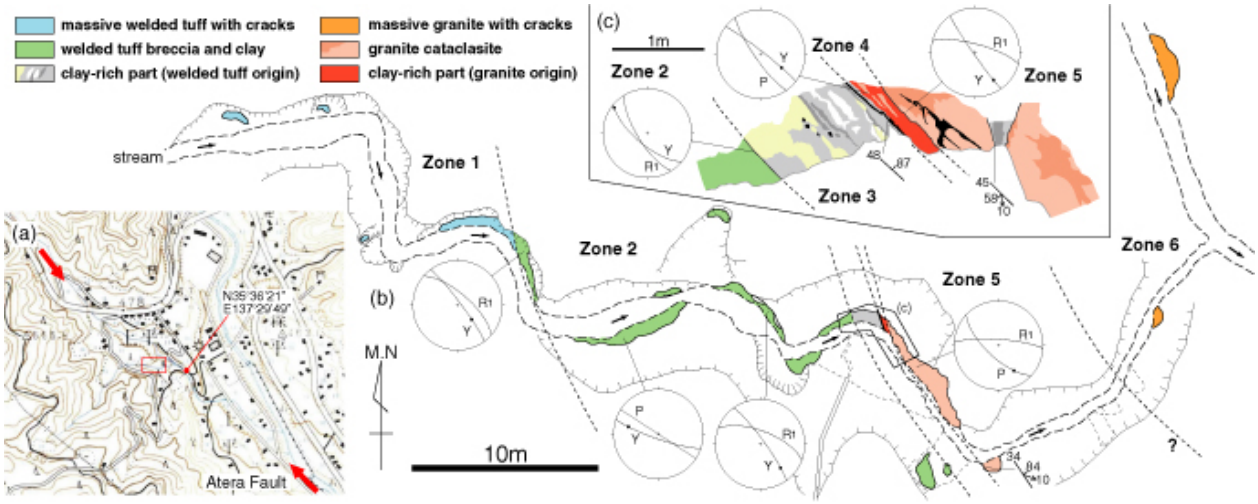

Fig. (a) Location of the studied outcrops of the Atera Fault in Kawaue, Gifu Prefecture. (b) and (c) Route map and sketch of the studied outcrops.