

The latest event of the eastern Atotsugawa fault inferred from the outcrops at Sako, Hida City, Gifu Prefecture, central Japan

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Atotsugawa Fault (ATF), 64 km NE-SW trending right lateral strike-slip fault, is located to the border of Toyama and Gifu Prefecture, central Japan (Research Group for Active Faults of Japan, 1991). The fault is one of the main faults of Atotsugawa Fault System consist of some right lateral strike slip faults, for example, Ushikubi Fault.

The latest event of ATF is the Hietsu earthquake, that occurred in 1858 (Usami, 1987), and excavation survey performed at two sites (Nokubi in western, and Magawa in eastern) confirmed the age of that event (e.g. Research Group for the Atotsugawa Fault et al., 1989; Awata and Tsukuda, 1993; Nomura et al., 2002; Takeuchi et al., 2003). On the other hand, because of the dating at outcrops, geometry of surface fault traces and estimated magnitude of the latest event, Katagawa et al. (2002) suggested that the faulting has occurred only on western segment (western part of Saganuma) during the latest Hietsu Earthquake.

In this study, new outcrops were found at the eastern part of ATF at Sako, Hida City. Because the outcrops are important in understanding the paleoseismological studies of the eastern part of ATF, a detailed geological survey and carbon dating was done.

Outcrop A located on the east of Sako village is composed of old talus deposits derived from Tetori Group (TG; Cretaceous sedimentary rock) and recent fluvial deposit. In the contact between these two deposits is a reverse fault with a surface of N43E/80N.

N-S striking shear zone and many asymmetrical structures can be observed on talus deposits. These structures seem to be the result of mass movement, because the remains of Tetori Group strata and the shear zone could not be traced below.

The fluvial deposit consists of sand and gravel derived from Hida Gneiss, and contains carbonized woods and leaves. Carbon-isotope dating of the sample from the deposit indicates 140 \pm 30 yrBP.

Outcrop B located about 10 m upstream from outcrop A, is composed of the old TG which lies on the recent fluvial deposits with a fault contact of N20-40E/60W.

The fault gouge is composed of brecciated sandstones and mudstones formed when the TG was crushed by the fault. Felsic intrusive rocks in the TG also were observed.

In fluvial deposits three strata are comprised: sand and gravel (top), sand containing humid soil (middle; same as fluvial deposit of outcrop A) and gravels (bottom). Some fault gouges in fluvial deposits intrude into the hanging wall (TG).

The unconsolidated gravel strata covers the Tetori Group, fluvial deposits and the fault.

Although the strike and the dip of the fault on outcrop are significantly different from the average trend of ATF (about N60E), by tracing the fault, it was revealed that the strike has been shifted to East. Accordingly, it seems that there was a small part of a bending zone of the fault on the outcrop. Irrespective of the bending zone on the outcrop, the trend still remains the same, because the trend of slickenline on the bended fault surface indicates S57W (plunging 18 degrees).

The carbon dating of the sample from the uppermost stratum of the fluvial deposits indicates 100 \pm 30 yrBP, and the gravel covering the whole underlying strata reveals modern.

The latest event and segmentation of the Atotsugawa Fault

From the result of the geological survey and the carbon dating, the latest event of faulting occurred as from 100 \pm 30 yrBP. The latest event at the outcrops is correlative to the 1858 Hietsu earthquake on the basis of the historical record of earthquake. Accordingly, the eastern segment of ATF, as well as the western, had also faulted at the latest event.

Because the faulting events in recent 10,000 years are almost compatible with western and eastern segment of the ATF (e.g. Takeuchi et al., 2003), it seems that the faulting event of ATF always occurs at the same time on both segments. Therefore ATF consists of one segment or could have come together within short geological time.