Comparison between fault zone architecture and the Coulomb stress change during the 1718 Toyama earthquake

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The Toyamagawa fault is a right-lateral active fault, located on the western margin of the Akaishi Mountains. It strikes ENE-WSW along the Toyamagawa River, and is composed of several discontinuous subfaults showing right steps in its eastern trace. Detailed traces of the western extension of the Toyamagawa fault have been investigated, leading a conclusion that the fault branches to three subfaults to the west in this area.

Each fault outcrop on the Toyamagawa fault shows asymmetric distribution of fault rocks, that is, cohesive fault rocks such as cataclasite and ultracataclasite are observed on one side of the slip surface, and incohesive or semicohesive fault rocks such as fault gouge and fault breccia are observed on the other side. Asymmetric distribution of slip surfaces in fault gouge are also observed in microscopic scale: fresher slip surfaces are unevenly distributed to one side in the fault gouge layer.

Seismological studies have shown that the pattern of the Coulomb stress changes (*delta* CFS) has some relationships with distributions of aftershocks. King *et al.* (1994) showed that approximately 85% of the aftershocks of the 1992 Landers earthquake occurred where *delta* CFS was positive. Kanamori and Brodsky (2004) suggested that distribution of the dynamic stress field during an earthquake would correspond somehow to that with static stress field possibly because both stresses are concerned with the fault geometry.

Observed asymmetry of fault zone architecture and calculated *delta* CFS during the 1718 Toyama earthquake are compared in this study. Asymmetric distribution of *delta* CFS across the fault zone is commonly observed. Larger *delta* CFS is observed on the side where incohesive fault rocks are generated. We also remarked a correlation between thickness of fault gouge layers and *delta* CFS. We show some examples of observations and calculations, and discuss the relationship between the fault zone architecture and *delta* CFS.