

Landform development on the eastern Tsukushi Plain, southwest Japan, since deposition of the Aso-4 pyroclastic flow

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To understand the distribution of Quaternary sediments transported from mountainous areas to lowlands in Japan, the interactions among local fluvial processes and their response to climate change must be understood. In general, deep valleys are incised in river deltas during glacial periods and then filled with sediment during the sea level rise of the ensuing postglacial periods.

The eastern Tsukushi Plain of Kyushu Island is formed mainly of sediments deposited by the Chikugo River and is bounded to the south by active faults at the foot of the Minoh Mountains. The southwestern and central parts of the plain are composed mainly of deltas bordering the Ariake Sea. There is an alluvial fan on the eastern side of the plain where the mouth of the river valley meets the plain. On the north side of the plain there are smaller alluvial fans deposited by tributaries of the Chikugo River. There are about 70 small fans formed on the southern part of the plain by tributary streams flowing north from the Minoh Mountains. Most of these topographic features were formed after deposition of the Aso-4 pyroclastic flows about 90,000 years ago.

Little is known about the landform development and subsurface geological structure of the area. I therefore investigated topographic profiles, subsurface geological structure, geochronology, and fluvial terrace formation in this area and reached the following conclusions.

1) In the area close to the present-day main channel of the Chikugo River, only a thin sequence of sediments has accumulated in the past 90,000 years and the surface gradient has changed little during that time. There is no evidence of deeply incised glacial valleys in the delta sediments. The large alluvial fan deposit at the eastern end of the plain consists today of erosional alluvial terraces. These observations indicate that the Chikugo River has been subjected to lateral erosion during a prolonged period of almost constant sedimentation rate.

2) The sedimentation rate (0.11–0.18 m/1000 years) estimated from the height of the upper surface of sediments of the Aso-4 pyroclastic flow is approximately equal to the average vertical slip rate (0.2 m/1000 years) of the active faults, which suggests that the elevation of the ground surface immediately after deposition of the Aso-4 pyroclastic flow was much the same as it is today, and that the influence of lower sea level during glaciation was small.

Considering points 1) and 2) above, it is likely that the accommodation space for sediment transported by the Chikugo River was provided by settlement due to movement of the active faults.

3) Small fans at the foot of the Minoh Mountains were deposited on an almost unchanged erosional base level, although the depositional area extended northward from the mountains onto the plain after the last glacial period. The ages of fluvial terraces did not correspond to global climate changes and the sedimentary surface of the plain on the northern side of the active faults was formed during the Holocene.