Diachronic dynamics of human-environment interactions

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Humans have attained their specific development by indigenous cultures and evolved through environmental adaptation. The session raises issues of human-environment interactions, views from diverse changes of climate, ocean, land and biota having made striking influence on humans. It welcomes various fields from human-environment change and their chronometric dating among Quaternary disciplines.

11:15 AM - 11:30 AM

Developing process of the erosional landform and the developmental mechanism of slope failure in Shirasu area

3-min talk in an oral session
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Pyroclastic flow deposits are distributed throughout Japan, dotting the country’s landscape. In Kagoshima Prefecture, in particular, the cliff overlain by “Shirasu” deposits has undergone repeated slope failures during a period of several decades, which is an extremely short timeframe for such activity (Tsukamoto, 1993). Ito pyroclastic flow deposits are part of a huge pyroclastic flow that occurred approximately 29,000 years ago (Machida and Arai, 2003); these deposits span an area of approximately 90 km from Aira Caldera, which was the source of Shirasu deposits (Yokoyama, 2000). Although the stratigraphic relationship between the erosional landform and the Shirasu deposits of volcanic ash and gravel layers is important, little research has been conducted on this topic. Among the current and the former incised valleys engraving Shirasu plateau, an ancient fossil valley has been identified; however, the factors contributing to the ceasing of its growth remain unknown (Yokoyama, 2000). This study examined the relationship between the developmental mechanism of slope failure and the long-term development process of the erosional landform in the Shirasu distribution area to clarify the region’s geomorphological evolution. In this presentation, we focus on the Satsuma Peninsula, which includes a part of the Shirasu plateau in northern area. In the peninsula, ancient shallowly incised valleys remain on the plateau, while the current deeply incised valleys have been dissecting the plateau. A landform classification map was made by interpretation of color aerial photograph in 1975 and by analysis of samples obtained from the plateau cliff that developed through erosion-denudation processes such as slope failure and erosion of Shirasu by running water; strength measurements were performed with a Schmidt hammer. The valley width decreases rapidly from the main stream valley to the tributary valley.
and in the current incised valley, from downstream to upstream corresponding to the high-density
distribution of failures in this site. The failure substance can be easily transported downstream because
the “Shirasu” rapidly changes fine sand and silt after the failure. The failure at the valley wall slope has
likely been continued by the valley width expansion of the current incised valley. Incision can be
estimated from the beginning edge of the downstream side of the original Shirasu located in the place
that is near to the East China Sea of the Satsuma Peninsula west, and has progressed in the upstream
side gradually. This is probably because that the attitude of the Shirasu deposition surface is low, and
the incised valley bottom is close to the base level of erosion, which has been almost stable during the
last 7ka. It is considered that lateral erosion of current incised valleys has continued during the time
whereby failure has occurred in the vicinity of the lower end of the incised valley wall. From a long-term
perspective, it can be said that the failure potential is high for current incised valleys dominated by
width enlargement processes.