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

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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.

Keywords: Shirasu, Slope Failure, Records, Geomorphological Development, Southern Kyushu