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In debris flow initiation zones, flows alter the topography of deposited sediments through their development by entrainment. Although it is possible that such topographic changes influence the magnitude of subsequent debris flows, this influence is not well understood because of the difficulty in conducting a temporal series of high-definition topography measurements. Therefore, to examine how topography affects the development of debris flows, we carried out structure-from-motion (SfM) photogrammetry from aerial shoots by an unmanned aerial vehicle (UAV) in the Ichino-sawa subwatershed of the Ohya landslide, in central Japan. Debris flow occurrences and rainfall were monitored using interval cameras and a rain gauge. In the gully in the hillslope, the sediment discharge was dominated by entrainment due to the deposited sediments that were gradually discharged by storm rainfall events. In comparison, deposition several meters thick typically occurred in the main channel. Consequently, the topographic changes in the main channel were more complex than those of the gully. Furthermore, in the main channel, the trends in the changes regarding the amount of sediment differed in the upper and lower parts of the confluence of the gully. In the upper part of the main channel, sediment entrainment and deposition occurred repeatedly after each debris flow, whereas entrainment by such flows dominated the topographic changes in the lower part. Consequently, deposited sediment supplied by a previous debris flow in the upper part contributed to the development of the subsequent debris flow. The results indicate that the magnitude of the debris flow was affected by the topography of the main channel created by previous flows, including flows from the gully.

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