

Analysis of Relationships between Morphology of Alluvial Fans and Geomorphic Properties of Source Areas

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Studies of alluvial fans and source basins are important to discuss geomorphic processes such as sediment transport and debris flow disasters in piedmont areas. Many researchers have discussed how properties of source areas such as slope, area, and lithology affect the morphology of alluvial fans. However, many of the previous studies were based on analogue data. Therefore, measurement of morphometric properties took large amount of time and efforts; the obtained results were not reproducible; and some parameters such as average slope of a basin were difficult to obtain. Furthermore, most previous studies analyzed fans only in a specific region.

This study obtains morphometric properties including area, average slope, and gradient of the main stream for both alluvial fans and source areas using GIS and DEMs, and analyzes relationships between the properties. Moreover, relationships between morphology of fans and lithological characteristics of source areas are analyzed using digitalized geological maps. In total 490 fans in the whole of Japan and 380 fans in the American South West were analyzed.

The inferred relationships between the morphometric properties show some differences depending on drainage basin area, pointing to different fan-forming processes in large and small basins. The relationships also differ between the American and Japanese fans, probably reflecting differences in sediment transporting processes (debris flow or fluvial flow) and climatic conditions. Analyses so far indicate no clear relationships between fan morphology and basin lithology, but more detailed analyses on this issue will be conducted.

Keywords: Alluvial fan, Drainage basin, Stream gradient, Basin area, Morphometric property, GIS