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The influence of block size and shape on rock fall travel distance

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Rock falls are common geomorphic processes in mountain catchments that affect the sediment budget and other geomorphic processes. The weathered rock fragments detached from rock faces or remobilized from sediment stores are transported downslope through a combination of falling, bouncing, rolling or sliding. On talus cones and sheets, rock fall debris is deposited depending on different grain sizes and the topography of the talus cones. Due to their energy and momentum, they can reach long run-out distances and can cause damage to human lives and local infrastructure facilities. Because of this, run-out calculation of rock fragments plays an important role.
For our analyses, we used high-resolution LiDAR data (terrestrial laser scanning) of rock falls in four different study areas with different lithological conditions situated in the European Alps (Villnößtal, Dreitorspitze, Zwieselbachtal) and on the Dolomieu crater of the active volcano Piton de la Fournaise on La Réunion.
Based on the LiDAR data we derived high resolution DEMs for all the investigation sites. Additionally we used the LiDAR point clouds to measure the three axes (x, y, and z) of every single block starting with a size of 0.5 m to calculate the axial ratio as an indicator of the block shape as well as the volume of each block. We also determined the Euclidean distance of each investigated block to the detachment area in order to obtain information about the run-out distance. Based on these data and the high resolution DEMs we tried to analyse how the block shape, the block size but also the morphometry of the talus cone (e.g. surface roughness, slope or curvature) affect the run-out distance of the single blocks and if there appear differences between the single test sites (lithology).