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# Shallow erosion on slopes in the European Alps - research review and further questions

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Due to the land use changes in the European Alps an increased occurrence of shallow erosion events was observed on slopes with various land use patterns during the last decades. The extent of the eroded areas, the so called 'Blaiken', ranges between 2 and 200 m2 with a depth of less than 2 m. The loss of material, regarding only single incidences, is comparatively low. However, when considering the total number of such erosion events, the amount of displaced material is enormous. Besides the displacement of regolith material, the erosion of topsoils is a serious problem. As part of the Soil Conservation Protocol of the Alpine Convention from 1991, soil is a valuable resource worthy of protection. Soil protection requires fundamental knowledge of the subsiding processes and the involved parameters.

The first approach of this work was a systematic synopsis of various surveys from different study sides located in the Alps. The aim was to define processes and the spatial distribution of erosion forms as well as the applied methods and surveying techniques. The results are discussed and analysed comparatively.

An important result is the finding that the appearance of this erosion type can include several processes. On the one hand the displacement appears as a consequence of shallow landslides or soil slips. In this case the process is related to gravitational mass movements. The occurrence requires a gliding horizon in the underground. A gliding surface in form of a preformed inhomogeneous zone often situated at the boundary between weathered material and bedrock or at boundaries in the regolith between layers of different physical properties (different material, bulk density, etc.). In other cases the gliding surface is located at the intersection of two soil horizons or just below the ending of a uniform developed root horizon. On the other hand snow gliding processes can cause the formation of 'Blaiken'. In contrast to the landslides the gliding snow body leads to a superficial abrasion of vegetation, humus and the upper soil. Sward damages caused by the passage of cattle also belongs to this type of shallow erosion. It follows that this type of soil erosion requires a moving medium.

Hence it is advisable to distinguish the occurrence of 'Blaiken' in consideration of the processes which take part. Only then the involved parameters can be evaluated. The most important parameters are topography (slope angle, aspect, elevation a.s.l.), geological settings (composition of regolith material), soil conditions, vegetation and land use. In most cases only a critical combination of these factors leads to erosion.

A review of relevant previous work also shows a lack of pedological information and information about the composition of regolith material. There is a need for further detailed studies. In addition effects of land use change should be taken in consideration because of the increased occurrence of erosion following abandoned land use.

Moreover the present work shows what type of documentation of occurred incidences exist and how this should be amended for better understanding of the ongoing processes and their monitoring.