



Efficiency of frost-cracking processes through space and time: An example from the eastern Italian Alps

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It is widely accepted that climate has a strong impact and exerts important feedbacks on erosional processes and sediment transport mechanisms. However, the extent at which climate influences erosion is still a matter of debate. In this study we test whether frost-cracking processes and related temperature variations can influence the sediment production and surface erosion in a small catchment situated in the eastern Italian Alps. To this extent, we first present a geomorphic map of the region that we complement with published ^{10}Be -based denudation rates. We then apply a preexisting heat-flow model in order to analyze the variations of the frost-cracking intensity (FCI) in the study area, which could have controlled the sediment production in the basin. Finally, we compare the model results with the pattern of denudation rates and Quaternary deposits in the geomorphic map. The model results, combined with field observations, mapping, and quantitative geomorphic analyses, reveal that frost-cracking processes have had a primary role in the production of sediment where the intensity of sediment supply has been dictated and limited by the combined effect of temperature variations and conditions of bedrock preservation. These results highlight the importance of a yet poorly understood process for the production of sediment in mountain areas.