



Exploring the potential of luminescence methods for dating Alpine rock glaciers

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Rock glaciers contain valuable information about the spatial and temporal distribution of permafrost. The wide distribution of these permafrost landforms in high mountains promotes them as useful archives for the deciphering of the environmental conditions during their formation and evolution. Age constraints are needed to unravel the palaeoclimatic context of rock glaciers, but numerical dating is difficult. Here, we present a case study assessing the potential of luminescence techniques (OSL, IRSL) to date the sand sized fraction of material in active rock glaciers. Our focus points at the signal properties and the resetting of the signal prior to deposition by investigating single grains. While most quartz shows low intensities and problematic signal characteristics, feldspar exhibits much brighter and well-performing signals. Luminescence signals far below saturation indicate a distinct but not homogeneous bleaching during transport. Hence, a modified minimum age model was used to determine the highest clustering of luminescence signals for age calculation. Luminescence ages are between 4 ka and 9 ka for three rock glaciers from the Upper Engadine and Albula region (Swiss Alps) and agree with age estimates derived by independent relative and semiquantitative approaches. Therefore, luminescence seems to have the potential of revealing age constraints about processes related to the formation of rock glaciers but further investigations are required for solving some of the problems remaining and reducing the dating uncertainties.