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Late Pleistocene Deglaciation History of the Southern Black Forest, Germany: Insights from Geomorphological Mapping, ^{10}Be Cosmic-ray Exposure Dating and Equilibrium Line Altitude Reconstructions

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The Black Forest temporarily hosted a 1000 km^2 large ice cap and its outlet glaciers during the Late Pleistocene. Multiple groups of moraines inside the last glaciation maximum extent document highly dynamic deglaciation. However, the chronology of periods of moraine formation remains largely unknown.

To fill this gap, moraines in Sankt Wilhelmer Tal, a well-developed trough valley north-west of the Feldberg were mapped with a high-resolution digital terrain model (DTM) and raster files derived from the DTM. This was complemented with geomorphological field mapping. Moraines with suitable boulders were sampled for ^{10}Be cosmic-ray exposure (CRE) to establish a regional glacier chronology. Previously published ^{10}Be CRE ages from the mountain regions of Central Europe and their forelands were recalculated for suitable comparison. Equilibrium line altitudes (ELAs) during moraine formation were reconstructed to assess whether palaeo-ELAs can be used as a tool for relative dating of moraines. Geomorphological mapping reveals moraines of 18 ice-marginal positions in the main valley and moraines of multiple ice-marginal positions in two tributary valleys. The CRE ages suggest that the deglaciation of the study area occurred during the last termination and provide evidence for two distinct periods of moraine formation. ELA reconstructions show that the ELA varied considerably across the study area during the second phase of glacier fluctuations. Differing ELAs impede the use of palaeo-ELAs as a tool for relative dating of moraines.

The CRE age-based glacier chronology significantly increases the knowledge of glacier variations in the mountain regions of Central Europe and provides important data for future palaeoclimatic

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reconstructions. As it could not be answered whether the outermost sampled moraine formed during the last glaciation maximum, ^{10}Be CRE dating and other suitable dating methods should be applied to moraines in other parts of the southern Black Forest to determine the timing of this event.

Keywords: Glacier; Moraine; Geomorphological Mapping; Cosmogenic Nuclide Dating; Equilibrium Line Altitude; Black Forest

Presentation time: Thursday, September 30, 2021 – PICO: 3.53 - 3.54 pm, individual discussion: 4.10 - 6.00 pm