

P.5-7: Challenges in luminescence dating of the last glaciation maximum in the southern Black Forest, Germany

Hofmann, F.M.^{1*}, Fülling, A.¹, Preusser, F.¹

¹University of Freiburg, Institute of Earth and Environmental Sciences, Albertstraße 23b, D-79104 Freiburg

*Presenting Author: felix.martin.hofmann@geologie.uni-freiburg.de

During the last glaciation maximum, an ice cap and its more than 20 kilometres-long outlet glaciers covered the highest summit of the Black Forest, the Feldberg (1493 m above sea-level), and the surrounding region [1]. This event has hitherto not been dated by applying up-to-date geochronological techniques to glacial deposits or landforms. Due to the lack of significant topographic control, the climate probably mainly controlled the mass balance of the ice cap. Dating its last maximum extent may thus have important implications for the reconstruction of atmospheric circulation patterns during the Pleistocene. A last glaciation maximum out of phase with the Alps would strengthen the hypothesis that a meridional atmospheric circulation prevailed over Europe during the last glaciation maximum in the Alps (at ca. 25 ka).

We aim at filling this gap by re-investigating a well-preserved, multi-ridged terminal moraine complex several kilometres north-west of the Feldberg. Since the beginning of the twentieth century, this landform is undisputedly assigned to the last glaciation maximum. As units of sorted sediments occur in two sections on one ridge of the terminal moraine complex, luminescence dating was deemed a suitable technique to infer the age of the landform. We decided to apply luminescence dating to both quartz and feldspar, as these dosimeters have different drawbacks. Since quartz from crystalline source areas often shows no or only a relatively weak luminescence signal, we anticipated that this also applies to the sampled sediments from the crystalline part of the Black Forest.

Optically-stimulated luminescence (OSL) measurements revealed a bright signal in quartz. Developing a suitable measurement protocol for determining the palaeodoses proved to be difficult. A thermally unstable medium component turned out to be the major obstacle. OSL measurements revealed palaeodoses in the order of 400 Gy below the saturation level. This finding contrasts with results of previous studies on glacio-fluvial sediments in the northern Foreland of the European Alps, as quartz from this area has a considerably lower saturation level. Although the measured palaeodoses are overdispersed, we did not find any obvious signs for partial bleaching. This possibility will be evaluated via further OSL measurements, since the sampled sediments were not transported over large distances. Component analysis will also be performed.

Infrared-stimulated luminescence (IRSL) measurements on feldspar will be undertaken. It is expected that anomalous fading and partial bleaching will be two major future challenges. To overcome the first problem, post-infrared IRSL dating will be applied. As resetting of this signal is more difficult when compared to IRSL and OSL signals, problems associated with incomplete bleaching may arise in future work.

Keywords Luminescence dating; Glacier; Last Glacial Maximum; Moraine; Black Forest

Reference

[1] Hofmann F.M., Rauscher F., McCreary W., Bischoff, J.-P., Preusser, F. 2020. Revisiting Late Pleistocene glacier dynamics north-west of the Feldberg, southern Black Forest, Germany, *E&G Quaternary Sci. J.* 69, 61-87