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Fluvial terrace gravels of the "Hochterrasse" (N-Alpine Foreland, Austria): luminescence characteristics of quartz and feldspar

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The Northern Alpine Foreland has played a major role in the investigation of glacial and furthermore paleoclimatic events. It was at the beginning of the 20th century, when Albrecht Penck developed the idea of four big alpine glaciations which extended into the alpine foreland. He developed the model of the glacial series in which he correlated terminal moraines with distinguishable terrace bodies. In the case of the fluvial sediments of the Hochterrasse (correlated with marine isotope stage (MIS) 6 in Austrian geological maps) the existence of numerical ages in the Austrian Alpine Foreland is sparse. This study is aimed at shedding light on the luminescence properties of quartz and feldspar derived from Hochterrasse systems in foreland valleys (Traun, Enns and Ybbs valley) so far attributed to the penultimate glaciation.
Coarse grain (100-200 μm) K-feldspar and quartz are analyzed by Infrared stimulated luminescence (IRSL), post-Infrared Infrared stimulated luminescence (pIRIR) and optically stimulated luminescence (OSL) methods. One of the issues that arise when dating glaciofluvial quartz from this area is the apparent underestimation of the quartz ages which can vary up to 50% from the calculated IRSL ages. Linearly modulated OSL shows a big contribution of thermally unstable components to the overall equivalent dose (De) which can add to the general underestimation of quartz. Also the measurement of feldspar aliquots is anything but trivial. Luminescence signal intensities are very viable for the samples from the Enns and Traun valley. The samples derived from the Ybbs valley in contrast show very low feldspar signal intensities on most aliquots. Thermal transfer has shown to have negligible impact on the overall paleodose for the feldspar samples (maximum 1% of the paleodose attributed to thermal transfer). In contrast anomalous fading seems to be affecting all feldspar samples. However an assessment of the amount of signal loss in time is difficult to determine because of high g-value scatter. Attempts to overcome the fading issue by the use of a pIRIR measurement protocol with 225°C stimulation temperature seem to be successful as fading corrected doses and the doses derived from pIRIR measurements agree within errors. After 4h of sunlight exposure, pIRIR residual doses of 6.5-12 Gy were measured, corresponding to less than 4% of the total De.

The preliminary results show that the specific application of OSL and IRSL methods for samples derived from the Austrian Northern Alpine Foreland has to be adjusted with regard to the variable luminescence properties. Despite difficulties in dating, the MIS 6 correlation seems to be valid for many of the Hochterrasse bodies – though not for all.