Early to middle Pleistocene glaciofluvial terraces along the North Alpine Foreland: What do they tell us about glacial and mountain range dynamics?

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Remnants of glaciofluvial sediments in the North Alpine Foreland may host first order information on glaciofluvial processes of Quaternary climatic change. Outwash formation and preservation in the foreland region of the Alpine mountain range are not only a function of (factors related to) climatic variabilities. Other factors relate to the elevation distribution of the drainage basins (*i.e.*, the hypsometry), controlling for example: i) the volume of glaciers and thus the extension of outwash or, during times of relative glacier absence; ii) the fluvial stream power which in turn impacts the preservation potential of terrace bodies. While major climatic deteriorations (*e.g.*, glacial maxima) impact the northern Alps and its foreland rather in a uniform way (some west – east precipitation gradient), major hypsometric variations appear more distinct along the belt.

Since the ground-breaking work of Penck and Brückner (1909) almost no further studies attempted to establish a model where site-specific observations are fitted in a range-scale model. It turned out that the original model, suggesting a four-fold glacial model where ice advances in the North Alpine Foreland, cannot explain various local records. For example, while glacial and glaciofluvial deposits seem to cover the Early Pleistocene or even Pliocene in the West Alpine Foreland but without connection to glacial landforms, the situation is different in the eastern part. Ice marginal deposits of not only the LGM, but two to three earlier glacial maxima can often well tied to outwash deposits (the older the higher), but evidence of Early Pleistocene glaciofluvial deposits (or even older) is sparse or not existing – including absolute age information. Most studies therefore tend to develop models from a local perspective, neglecting Quaternary variations in glacial advance along the belt. The development of ideas to integrate local findings and relative age constraints into a regional model is therefore highly needed to better understand factors and feedbacks acting on Quaternary glacial advance and retreat cycles on a regional scale. The lack of absolute age data is a further major issue in most stratigraphic studies (dealing with deposits exceeding the feasible luminescence age range) but local depositional characteristics generally allow establishing relative age models (*e.g.*, through biostratigraphy, terrace elevation range, degree of weathering).

In this study we aim to compile data of pre-LGM outwash (*i.e.*, terraces) of the entire North Alpine Foreland to provide a discussion basis for an overall stratigraphic model and to better evaluate larger forcing scenarios (i.e. better understand driving factors/mechanisms). In this context the study also aims to suggest key areas for future dating campaigns. For this study we establish a database including the available glaciofluvial outwash deposits from different Swiss, German and Austrian sources. Mapped surfaces are cross-checked against (high-resolution) DEM data and, if available, supported by outwash base data. Terrace remnants serve as constraints to establish palaeosurfaces and evaluated regarding its distribution across the foreland. Moreover, processed data allows better evaluating the role of non-climatic factors in terrace distribution, like the role of base level variations (Danube *vs*. Rhine), ranging specific characteristics in topography and tectonics (Eastern *vs*. Western Alps) or shifts in the (tributary) drainage systems.

REFERENCES

Penck, A., Brückner, E. 1909. Die Alpen im Eiszeitalter. Tauchnitz, Leipzig, 1199 pp.