asymmetric D4 folds, which also affect the D3 thrust boundary of the Penninic to Lower Austroalpine nappe complex. D4 folds plunge gently to E/ENE and have amplitudes of ca. 1 – 2 km connected with outcrop-scale D4 folds with a steeply S-/SSE-dipping, mainly cataclastic axial surface foliation. The D4 folds indicate a previously unrecognized stage of shortening of Lower Austroalpine units with a minimum shortening estimate of ca. 30 percent. The new data are similar to D4 N-S shortening structures occurring over the whole N-S section in the Eastern Alps and include internal thrusting within the Northern Calcareous Alps.

Quaternary deformation structures in Pleistocene conglomerates of the Salzach valley, Austria and on the Dachstein peneplanation surfaces

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The recognition of Quaternary deformation structures within northern sectors of the Eastern Alps remains poor, although geodetic strain measurement indicate shortening of Esatern Alps up to its northern margin. Only a few examples of deformation structures have been reported. The study of Pleistocene conglomerates (Nagelfluh) within Alpine valleys is particularly promising, e.g., ESE-directed normal faulting and NE-SW compression has been reported from the Enns valley (Keil & Neubauer, 2011). Deformation structures are found in Pleistocene conglomerates of the Salzach valley between Salzburg city and Golling and these resultss are complemented by structural observations on the glacially overprinted and elevated Dachstein peneplanation surface (at an altitude of ca. 2.200 m) on satellite imagines. Glacial overprint at this elevation allows distinction of faults and fractures predating last glacial polishing from such postdating it. A first field example for such a post-glacial fault was described by Frisch et al. (2001).
The Pleistocene conglomerates of the Salzach are affected by three types of tectonic structures: (1) Deformation bands in conjugate Mohr-type arrangement are particularly widespread in three-dimensional exposures of the Hellbrunnerberg. These structures mainly indicate ESE–WNW extension. (2) Normal faults with up to 1.5 m displacement show a similar ESE–WNW extension direction. In contrast some outcrop-scale thrust faults with ca. 20 – 30 cm were found, too. (3) Finally, subvertical open NW-trending extensional faults are interpreted to indicate NW-SE extension. Together, these structural data suggest at least two different regimes, and the mutual relationships remain still unclear.
Satellite images of the elevated Dachstein peneplanation surfaces consistently indicate pre-glacial NNE-SSW fractures interpreted to represent NNE-SSW contraction (of likely Oligocene-Miocene age). Post-glacial unpolished fractures trend NW–SE and in rare cases NE-SW (some with sinistral displacement).
Together, the new field data indicate at least two different tectonic regimes during Quaternary and, therefore, a possible change in kinematics during Middle-Late Pleistocene. Supposedly, glacial loading might have increased tectonic strain, which was released during melting after the last glacial maximum.

References

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