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# DETACHMENT FOLDING ABOVE THE PERMIAN HASELGEBIRGE (ECHERNTAL, HALLSTATT, NORTHERN CALCAREOUS ALPS)

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The Northern Calcareous Alps, which belong to the northernmost part of the Upper Austroalpine thrust complex, represent a fold-and-thrust belt that has been affected by thin-skinned tectonics. The carbonate-dominated successions got deformed in a brittle style when they were decoupled along detachment horizons with relatively low shear strength like evaporates or shales. The late Permian to early Triassic evaporates of the Austroalpine Haselgebirgs-formation, which consists mainly of a halite-clay matrix with components of carbonate, halite, anhydrite and clay, make up the basal detachment of the Northern Calcareous Alps.

Our field area is situated around the Echerntal valley in the central part of the Dachstein nappe where the lagoonal sediments are tectonically juxtaposed with the pelagic sediments of the Hallstatt nappe. The Hallstatt nappe within the evaporitic Haselgebirge, which contents one of Austria's most prominent saltmines, is located north of this valley. The structural relation to the Dachstein nappe and the differences in style of deformation are still a point of discussion (e.g. Frisch and Gawlick, 2003). Against the dominant tectonic model, which demands a top-to-north displacement, field observations in the Echerntal and surrounding areas confirm thrusting towards the west to northwest (e.g. Linzer et al. 1995). Sedimentary surfaces and thrust faults are generally dipping towards the east and in bedding-plane parallel slickensides, which evolved by interbed slip, evidences for a top-to-west movement were found. The westward thrusting is also indicated by geometric structures like duplexes, kink bands or internal antiformal stacks within the same lithological units.

Although the Hallstatt and Dachstein nappe both show the west to northwest direction of movement, there are clear differences in the style of deformation. In the Dachstein nappe fault-bend-folding and forland vergent duplexes are typical, whereas in the Hallstatt nappe additional detachment folds and hinterland vergent structures are observed. These differences are caused by different viscosity or thickness, with respect to the overburden thickness, of the detachment horizon. Detachment folds develop over a detachment or thrust that is bedding parallel and they require a ductile décollement layer which can infill the space generated at the base of the fold (e.g. Suppe, 1985).

Because of the extremely well constrained geometry of the detachment fold, which can be studied on the surface and in the saltmines, three-dimensional geometry can be directly compared with published results from analogue models (e.g. Costa and Vendeville, 2002, Cotton and Koyi, 2000).

## References

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