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## Microsedimentology of tills near Ainet, Austria -were palaeo-ice streams in the European Alps underlain by soft deforming bed zones?

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### Abstract

Fast moving palaeo-ice masses within the European Alpine Ice Cap (EAIC) during the Last Glacial Maxima within the large valleys of the European Alps can be compared to ice streams that drained the larger Quaternary Ice Sheets in Europe and North America and the modern East and West Antarctic Ice Sheets. Unlike these continental-style ice sheets, the ice inundating the European Alps flowed first through confined bedrock valleys that, at close to the glacial maximum, acted in similar manner to ice streams in the North American Cordilleran Ice Sheet. Knowledge of the subglacial environments illuminates controls in basal ice activity in terms of overall ice sheet mass balance based upon a grasp of basal thermal regimes, sediment availability and rheology, as well as subglacial hydrological conditions.

Debate continues as to basal ice temperatures and sliding velocities as well as basal interface conditions whether on hard or soft beds in many inner and marginal zones of EAIC. Little mention exists as to the extent of soft sediment basal deformation although increasingly such conditions are known from several parts of the EAIS. In particular, in the Drau (Drava) ice stream, an upper branch of the large Sava Ice Stream, appears as a fast-moving ice mass that would likely be underlain by soft deforming sediment. It is the underlying microsedimentology of parts of the Drau Valley in the Lienz area of Austria that is the focus of this research.

Past research on tills has demonstrated that the use of microsedimentology and the examination of multiple microstructures reveals details of till sedimentology surpasses most macroscale examination of tills. The tills of the Drau Valley at Ainet occur from the valley bottom to high up on the valley side. Thin section examination of these tills reveals a detailed depiction of soft sediment deformation processes throughout the basal zones of this ice stream illustrative of temperate basal ice conditions. The tills exhibit the characteristics typical of ongoing active deformation while being emplaced and post-emplacment stress effects such that the evidence from Ainet supports the contention that most likely ice streams in the palaeo-EAIC were similar to those today in Antarctica and in the Quaternary ice streams of the Laurentide and North European Ice Sheets.