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Geochronology, based on pollen and isotopes, of a Late Glacial gyttja deposit in Vorarlberg, Austria

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The Gasserplatz, a peat biotope with histosols, is situated 1 km NE of Feldkirch in Vorarlberg. During the last deglaciation, i.e. the retreat of the Ill glacier by the end of the Oldest Dryas, a tiny ice-marginal lake here developed in a sheltered position at an elevation of 439 m.a.s. After local deglaciation, lacustrine carbonate (chalk gyttja) deposited. At the beginning of the Holocene the lake changed into a peat bog with peat accumulation.

The soil archive of the Gasserplatz contains a 6m undisturbed high quality paleoecological record, a sequence of Late Glacial and Holocene deposits. To 'read' this record we applied pollen and isotope analysis on the Late Glacial lacustrine carbonate deposits. Research on the Gasserplatz profile will be continued by pollen analysis and radiocarbon dating of the Holocene peat deposits.

The sedimentation in the former lake started with sterile clay deposition (70 cm) on till. Around 13,000 BP (radiocarbon years) deposition of a 270 cm lacustrine carbonate section started. The deposition rate was rather constant, about 0.85mm per year during almost 3000 years. Peat accumulation started at around 9,500 BP.

The pollen diagram of the lake marl deposits shows the vegetation development starting at 13,000 BP. The oldest spectra (535-500 cm) reflect a pioneer vegetation (Artemisia, Helianthemum, Gramineae), followed by invasions of Betula, Juniperus and Pinus. Oscillations in Betula percentages are probably caused by temperature variations.

14C dating of the lake marl deposits is not straightforward. Depending on the source materials (shale's, organic mud, peat) we found different ages at the same depth in the core. Shale's and fibric peat provide the best results for a correct geochronology of the record.

[U+F064]13C variations show (1) periods without and with biomass production, and (2) qualitative properties of produced biomass. Both are related to temperature. Due to the low concentration of C atoms in water, [U+F064] 13C values are very sensitive for system changes.

In polar ice cores, d18O variations reflect directly changes in the composition of precipitation, which is a proxy for climatic change. In lacustrine carbonate sediments the d18O values are influenced also by factors like evaporation and lake feeding drain water from the surroundings, but in general the trend in the d18O curve can be correlated with trends in ice cores.

Oscillations in the pollen curves (e.g. Betula) and isotope curves of the Gasserplatz core can be correlated. The d18O oscillations of the Gasserplatz core correlate with the polar ice core oscillations and can be used to derive a correct geochronology of the lacustrine carbonate deposits. As a consequence, both pollen and isotopic

analysis can be used to reconstruct the evolution of the lake system.