Geophysical Research Abstracts, Vol. 8, 04213, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04213

Seasonal temperature reconstruction based on diatom and chironomid assemblages from a high altitude lake (Lej da la Tscheppa, Switzerland)

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Lake sediments provide valuable environmental archives for reconstructing past changes in continental climate. However, the evaluation of palaeoclimate reconstructions by comparison with instrumental measurements is complicated in many parts of Europe by the widespread pollution of lake ecosystems during the industrial period. In contrast with lowland lakes, human influence on high-altitude mountain lakes has been less severe in many instances, providing the possibility of comparing palaeoclimate reconstructions during the past centuries with reconstructions based on instrumental measurements or historical records. Lej da la Tscheppa is a high altitude lake (2616 m asl) in the Engadine region of Southeast Switzerland. The lake's catchment largely consists of boulders, blocks, and bare rock making it unsuitable for pasturing. A 41 cm long sediment core was obtained from the lake using a gravity corer and analyzed at a high temporal resolution for fossil diatom and chironomid assemblages. Sediments were dated using Pb-210 and linear extrapolation of sedimentation rates taking into account changes in microfossil concentrations. Diatom assemblages record a distinct increase in planktonic taxa since the early 19th century, suggesting a decrease in the duration of ice-cover on Lej da la Tscheppa. In contrast, chironomid assem-

blages remained stable during a large part of the record, with major changes occurring only in the past ca. 100 years. We used an established chironomid-based summer air temperature transfer function and a newly developed diatom-based spring air temperature transfer function to reconstruct past seasonal air temperature changes at Lej da la Tscheppa. The reconstructions indicate a warming trend in spring temperatures during the past c. 400 years, whereas inferred summer temperatures suggest a slight cooling trend. These reconstructions are in good agreement with a reconstruction of local temperatures in the Engadine region based on instrumental station data and documentary proxy evidence from the Alps. Our results suggest that in high-altitude lakes independent chironomid- and diatom-based seasonal temperature reconstruction are possible and can be used to distinguish seasonal temperature trends.