

ORAL PRESENTATION

A HIGH-RESOLUTION DIATOM-INFERRED CLIMATE RECONSTRUCTION FROM A DEEP ALPINE LAKE

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We have analyzed diatoms from the glacially-varved sediments of Lake Silvaplana (Upper Engadine Valley, Switzerland) to produce a sub-decadally resolved record of temperature variability for the last 1000 years. An inference model for mean July air temperature was developed from a regional training set of 110 lakes using weighted-averaging partial least squares regression and calibration. Although temperature was shown to independently explain significant variance in the training set, total phosphorus (TP) was significantly correlated to temperature ($r=0.59$) and the influence of TP on the diatom assemblage is retained in the final inference model. Consequently, inferred shifts in temperature may actually represent independent changes in TP. This can be seen clearly in our record between 1950 and 1982, when cultural eutrophication strongly impacted the lake and inferred temperatures do not match the instrumental record. However, excluding this period, diatom-inferred temperatures are significantly correlated to the instrumental record. Prior to 1820 the diatom record shows little variability and therefore the reconstructed variables indicate stable conditions. However, other aquatic proxies (chrysophytes and chironomids) show evidence of climate variability at this time. We also examined the record of diatom accumulation rates in Lake Silvaplana. Factors such as turbulence, stratification, turbidity and nutrient availability, which influence the productivity of planktonic diatoms, are ultimately controlled by climate. Unlike the training-set based reconstructions, diatom flux rates show variability throughout the last millennium.

Lake sediments provide an integrated record of diatom production that obscures seasonal patterns. Therefore, we have analyzed sediment trap data to better understand the climatic factors that locally control diatom production and succession. *Cyclotella* species, typically the dominant species on an annual basis, are associated with the period of summer stratification although they also may bloom in autumn. *Stephanodiscus* species bloom in the spring, when mixing increases the supply of phosphorus to the water column. *Asterionella formosa* blooms in the autumn and/or spring. *Tabellaria flocculosa* production was significant in the winter months of 2002 and 2003. High diatom production appears associated with warmer temperatures. However, production during 2003 (the warmest summer) was slightly less than that of 2002, when temperatures were above normal persistently from January to June. Productivity was low in the fall of 2003 and was also low during the summer of 2004 and early 2005. Precipitation variability may have also influenced the supply of nutrients; 1999-2002 were wet years, while 2003-2005 were dry.