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Late Holocene summer temperature reconstruction from chironomids of Lake Anterne (Northern Alps, France).

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For the first time in the French Alps, the last 1800 years summer air temperatures have been reconstructed from chironomid assemblages.

Lake Anterne is located in the Sixt-Passy natural park in the northern French Alps at 2061 m a.s.l. The small lacustrine basin of 600 X 200m has maximum depth of 13.2 m. During winter 2001, a 14.5 m long sediment column was retrieved at the deepest part of the lake using an UWITEC corer from the frozen lake surface. The chronology of the record is based on eyes-counting of varves along the core. The lead contamination of sediments confirmed the accuracy of the varve-derived chronology as the main lead contamination episodes reported by Renberg et al. (2001) and supposed to be synchronous all over Europe were found at their forecasted age (Arnaud et al. 2005). Subfossil chironomid assemblages were studied from 50 samples taken along the first 8 m, which covered the last 1800 years. Summer air temperatures were reconstructed from the chironomid succession using an inference model built on chironomid assemblages in the surface sediments of 100 Swiss lakes. The transfer-function was based on weighted averaging–partial least squares (WA-PLS) regression and featured a leave-one-out cross-validated coefficient of determination (r2) of 0.81 and a root mean square error of prediction (RMSEP) of 1.40 ˚C.

The Lake Anterne record features a ca 1˚C cooling period between 400 and 650 AD, this episode may be correlated to the “migration period” marked by harsh climate con-

ditions in many European records. Another cold episode was found between 1350 and 1900 AD, temperatures were 2˚C colder than during the preceding Medieval Warm Period (700-1350 AD) characterised by summer temperatures around 10˚C. The MWP was also interrupted at ca 1150 AD by a short and abrupt cooling event.

The accuracy of these temperature reconstructions is suggested by the good correlation found with other climate records in the zone such as glacier fluctuations (Holzhauser et al. 2005).

Moreover, this study brings new results about summer temperature changes, which, in combination to other proxies studies in the area (for example paleohydrology reconstructed from lake levels or detritic signal in alpine lakes), allow to understand the late Holocene climate variability in its whole complexity. From these results, Lake Anterne record appears as a key-site for reconstructing at high resolution climate variability through the entire Holocene.