



On the paleoenvironmental potential of 253 newly discovered pine stumps from Zurich, Switzerland

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The transition from the last Ice Age to the early Holocene $\sim 15'000$ - $10'000$ BP represents a close natural analog to the ongoing and predicted rates of anthropogenic climate change. A reduced quality and quantity of high-resolution proxy archives during this period, however, limits our understanding of the magnitude and pace of Late Glacial (LG) environmental variability. Here, we present the world's best preserved, most replicated and oldest forest remains: A total of 253 subfossil pine stumps were recently discovered in Zurich. The combined approach of tree-ring and radiocarbon (^{14}C) measurements results in an absolutely dated Preboreal Swiss tree-ring width chronology and eight floating chronologies. With tree ages ranging between 41 and 506 years, often including pith and bark, and a mean segment length of 163 years, this exceptional find is distributed over nearly 2'000 years between the Allerød and the Preboreal. Together with 200 previously collected LG pines from the greater Zurich region, this study sets a benchmark in terms of sample replication and dating precision for stable more dynamic climatic periods such as the Laacher See eruption, the Older and Younger Dryas. The paleoenvironmental significance would even increase when annually resolved ^{14}C -measurements help fixing a major, Northern Hemispheric gap in the absolutely dated dendro time series during the Younger Dryas. While overcoming this interlude, our results further emphasize the importance of interdisciplinary research on these striking LG climatic shifts to better understand and assess their ecological and environmental impact.