Using anatomical techniques to describe subfossil wood decay

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Multi-centennial to millennial tree-ring chronologies, consisting of different sources of relict wood material, are important for archaeological dating and paleoclimatic reconstructions. A variety of wood decaying processes, however, often hampers the analysis and interpretation of such wood. Here, we demonstrate that anatomical studies can provide unique insights into wood structure and quality, ideally improving the cross-dating success of highly decayed ring-width sequences. We therefore introduce state-of-the-art sample preparation, thin sectioning and staining techniques to some of the world's best preserved Late Glacial pines that were growing ∼13'000 years ago in the current city of Zurich, Switzerland. Being characterized by different rates of biological degradation and mechanical failure, a careful consideration of wood anatomical parameters of our subfossil material not only facilitates cross-dating during periods of particularly narrow rings. It also reveals a better understanding of the direct and indirect factors that were possibly involved in the repeated forest dieback at the transition from generally cooler Late Glacial conditions into the overall warmer Holocene. Our results emphasize the relevance of using wood anatomical techniques routinely in the assessment of all kinds of relict wood, originating from historical constructions, archeological excavations and subfossil deposits.