Source: Schleser G, Winiger M, Bräuning A, Gärtner H, Helle G, Jansma E, Neuwirth B, Treydte K (eds.) (2003) TRACE - Tree Rings in Archaeology, Climatology and Ecology, Vol. 1: Proceedings of the DENDROSYMPOSIUM 2002, April 11th - 13th 2002, Bonn / Jülich, Germany. Schriften des Forschungszentrums Jülich, Reihe Umwelt Vol. 33, p. 10 - 12.

Dendroarchaeology from a palaeodendroecological perspective: the case of Bronze and Iron Age pile dwellings in Southwest Germany

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Since 1982 systematic timber and tree-ring investigation of Southwest German bog and lake-shore sites has been carried out by the Tree-Ring Laboratory of the Baden-Württemberg Office for the Protection of Ancient Monuments in Hemmenhofen. Within the scope of landscape and settlement archaeology, strong emphasis has been placed upon the interrelation between man, timber and woodland (Billamboz 1992, 1996). The analysis of archaeological data from a palaeodendroecologial perspective represents an extension of this approach. The first application developed here concerns Bronze and Iron Age wetland occupation during the course of the entire second millennium and the first half of the first millennium BC in Upper Swabia and the Bodensee area (i.e., Lake Constance). Parallel to the final publication of a large scale excavation, namely „Siedlung Forschner“, Federsee (Billamboz, in Press), such palaeodendroecologial investigations were undertaken within the framework of the Project – „Wandel von Landschaft und Siedlungsweise im Übergang vom Subboral zum Subatlantikum im Bodenseeraum“, a subproject of the main program of the Deutsche Forschungsgemeinschaft „Geo-Biosphäre der letzten 15 000 Jahre“ (time slice III).

Particularly topical in current pile-dwelling research is the question of climatic influence on the evolution of wetland occupation and related settlement patterns. Supporters of this theory argue using correlations between archaeological evidence and phases of reduced radiocarbon production, presumably related to increased solar activity (Magny 1993, Groß-Klee, Maise 1997). Using this approach, only the dendrochronological felling dates are taken into consideration, not the tree-ring data itself. The following question is therefore raised: what can tree-ring analysis contribute to the question of the interrelation between man, climate and environment and more specifically to the question of a climatic stimulation of wetland occupation? The focus of this analysis was aimed at the time slice between 2000 and 500 BC, a period with sustained long term variations in radiocarbon production. On the basis of cross-dating different tree species from both zonal and azonal vegetation, an attempt was made to differentiate the local and global factors which concurrently influenced tree growth, site conditions and settlement possibilities in wetland areas.

Beneath the large sample series of the Siedlung Forschner, which consists of not less than 12 000 samples (7000 posts and 5000 horizontal woods) further reference material can be provided by other wood findings from excavation. The most important are cited here:

-At Bodensee- the early Bronze Age lake-shore sites of Bodman-Schachen I and Egg-Obere Güll I, the Late Bronze Age sites of Hagnau-Burg, Mainau-Nord and Unteruldingen-Stollenwiesen and the Late Bronze and Early Iron Age peninsular settlement of Uerschhausen-Horn at Nussbaumersee (Thurgovia, CH).

-At Federsee- the Middle Bronze Age track ways of Bad Buchau-Wuhrstraße, the Late Bronze Age bog settlement of the „Wasserburg“ Buchau, as well as the Early Iron Age fishing weirs of Oggelshausen-Bruckgraben.

Analysing the wood from Siedlung Forschner allowed a closer insight into the construction history of this bog settlement. This site exhibits a consistent defensive usage during the tree main phases of occupation (between 1767 and 1480 BC). Beyond the chronological aspects, further considerations such as the supply of timber and the first forms of woodland management, as well as the composition and development of woodland surroundings, could be derived from this approach. On the one hand, the well-defended settlement structure system gives the impression of stability. On the other hand, wood investigation exposes tangible changes in both timber supply and consequent adaptation of construction leading to a sharper perception of the changing environmental conditions of the settlement.

An approach to the interaction between evolution of climate, environmental change and settlement behaviors in wetland areas was made based on an evaluation of the timber documentation in conjunction with tree-ring information. In this way, long term settlement evolution, already deduced from other analysis methods, could be more precisely defined, specific to periods of wetland occupation. With the help of statistical representation of anatomical determination of tree-species and of dendrotypological analysis (a classification of timber according to the dendrological, dendrochronological and techno-morphological parameters), human influence on woodland development and crop dynamics could be highlighted.

Firstly, for the evaluation of tree-ring data, a growth trend analysis was made, with special emphasis on high and medium frequency variations. For this purpose, local series were built with regard to cambial age and the high frequency signals were removed using an 11yr low pass filter (Fritts 1976). Finally, the series were expressed as a departure from the mean, in units of standard deviation. The second method used concerns single year analysis (pith, pointer and cutting years). Chronological phasing could be derived from a synthetic presentation and subsequent evaluation of the results. Considering the numerous synchronous positions between negative depressions of growth and brief gaps in wetland occupation, there is some evidence to support a relation between wetland settlement development and short term regional fluctuations of climate with corresponding environmental changes on a local scale. This conclusion is supported by the comparison of our results with those of other centers of pile-dwelling research north of the Alps. The evolution of occupation, with short term flourishing or diminishing development, can be similarly identified in the Early and Late Bronze Age. Thus theories of climatic stability during the course of both periods become rather doubtful.

Finally, the comparison of these results with proxy data evaluated by other means (geobotany , geomorphology, glaciology and limnology) underlines the accuracy of dendrochronology in the approach to the above assessed evolution, which occurs at high and medium frequency, with a turnover of around 10 years. The methods presented here can now be transferred to forthcoming applications, in other regions and for other time periods.

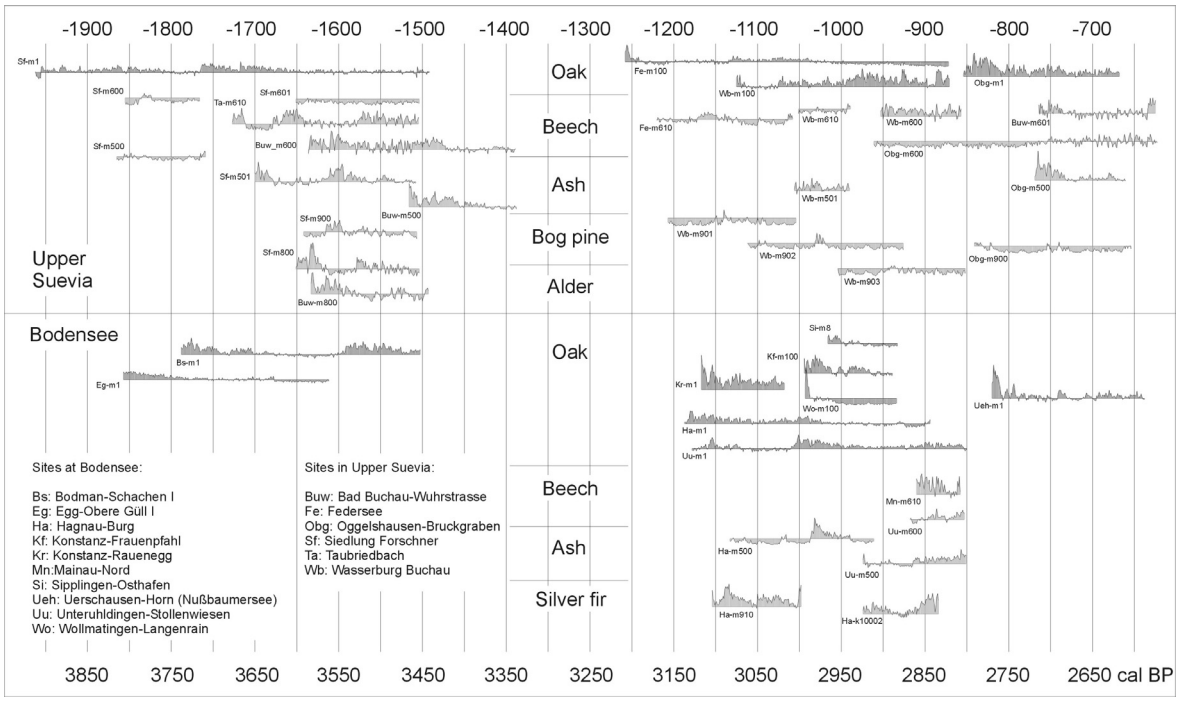

Figure 1: Local chronologies from Bronze and Iron Age bog and lake-shore sites in Southwest Germany with cross dating chart of different tree-species from the zonal and azonal vegetation between 2000 and 500 BC. The curves are low-pass filtered after Fritts, 1976, and the horizontal line corresponds to the 1mm-width.

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