New master chronologies from historical and archaeological timber in Eastern Austria.

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Cross-dated tree-ring series originating from living trees (114 sites) as well as historical wooden samples (almost 500 objects), from the central and eastern part of Austria, were split into four regions: Northern foothills of the Alps, the alpine region, southern foothills of the Alps and easternmost Austria. The borders of these regions were defined by the forest eco-types, and the existing climatic regions (mainly precipitation) in Austria. For all four regions master chronologies could be established.

Chronologies of Norway spruce (***Picea abies* L. Karst.**), fir (***Abies alba* Mill.**) and larch (***Larix decidua* L.**) are common in all regions. Setting up an oak- (***Quercus sp.***) chronology was possible for the most eastern region of Austria. At eastern Austria a pine (***Pinus nigra* L.; *Pinus sylvestris* L.**) chronology was established. Likewise, a stone-pine (***Pinus cembra* L.**) chronology was established for the alpine region. Each single chronology was crossdated against all others (Table 2).

Bridging the period between roman (3rd century AD) settlements and existing wooden structures (10th century AD) was possible by using sub-fossil logs that originated from alpine lakes and bogs.

Figure 1: Grid beams of the chronologies

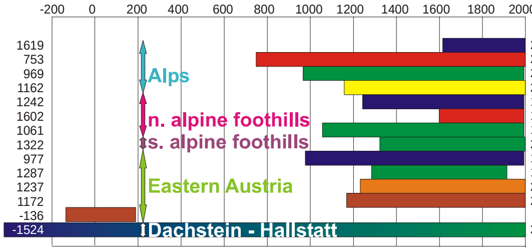


Table 1: Main statistics

no. of years	no. of series	mean segment length	mean series inter-correlation	mean sensitivity
385	182	157	0.529	0.183
1251	509	202	0.542	0.319
1035	1554	119	0.415	0.186
842	354	193	0.44	0.194
756	378	105	0.531	0.208
395	263	104	0.476	0.236
936	974	69	0.413	0.208
682	176	111	0.533	0.188
1022	897	68	0.596	0.254
629	417	65	0.479	0.256
767	917	155	0.588	0.315
832	469	108	0.566	0.227
325	61	112	0.586	0.154
3531	1121	147	0.476	0.217
Southern German Fir Chronology (© University Stuttgart Hohenheim)				
Central Europe Oak Chronology (© Labor for Dendrochronology, Zürich)				

Table 2: Crossdating the chronologies

	1		2		3		4		5		6		7		8		9		10		11		12		13		14	
	Glk	TvBP	Glk	TvBP	Glk	TvBP	Glk	TvBP	Glk	TvBP	Glk	TvBP	Glk	TvBP	Glk	TvBP	Glk	TvBP	Glk	TvBP	Glk	TvBP	Glk	TvBP	Glk	TvBP	Glk	TvBP
1																												
2	-																											
3	60	7.6	-																									
4	-		-		-																							
5	79	20.7	-		67	14.8	-																					
6	-		-		-		-		-																			
7	63	8.0	-		63	6.5	-		70	13.0	-																	
8	-		-		67	11.0	-		62	9.1	-		60	7.8														
9	-		-		61	7.9	-		74	20.1	-		67	14.6	-													
10	-		-		66	10.5	-		67	11.5	-		71	12.9	-		73	21.8										
11	-		-		61	4.7	-		65	7.6	-		65	6.0	-		-		-									
12	-		-		-		-		62	7.7	-		60	7.3	-		-		-		-							
13	-		-		-		-		-		-		-		-		-		-		-		-					
14	-		78	38.6	62	10.5	-		54	4.0	-		-		-		-		-		-		-		-			
15	-		-		63	9.3	-		75	21.5	-		68	12.8	-		74	22.5	-		-		-		-		-	
16	-		-		-		-		59	5.3	-		-		-		60	7.6	59	5.2	58	4.5	62	11.0	64	7.7	-	

Figure 2: The Dachstein-Hallstatt-Graph (indexed tree-ring chronology, number of series)

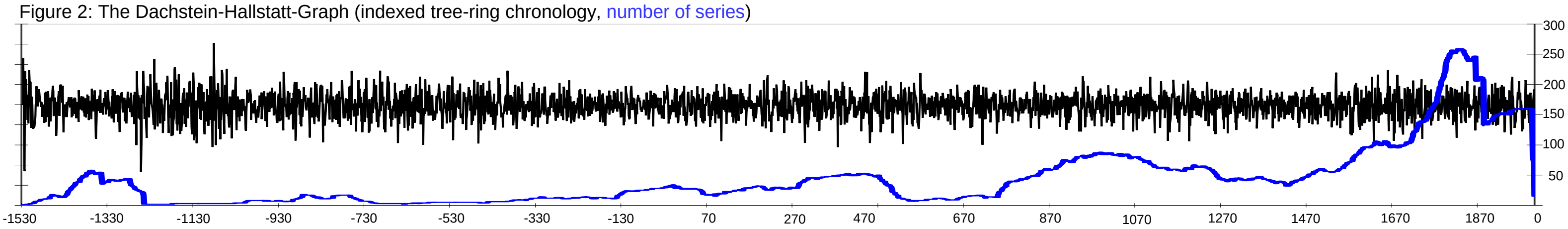
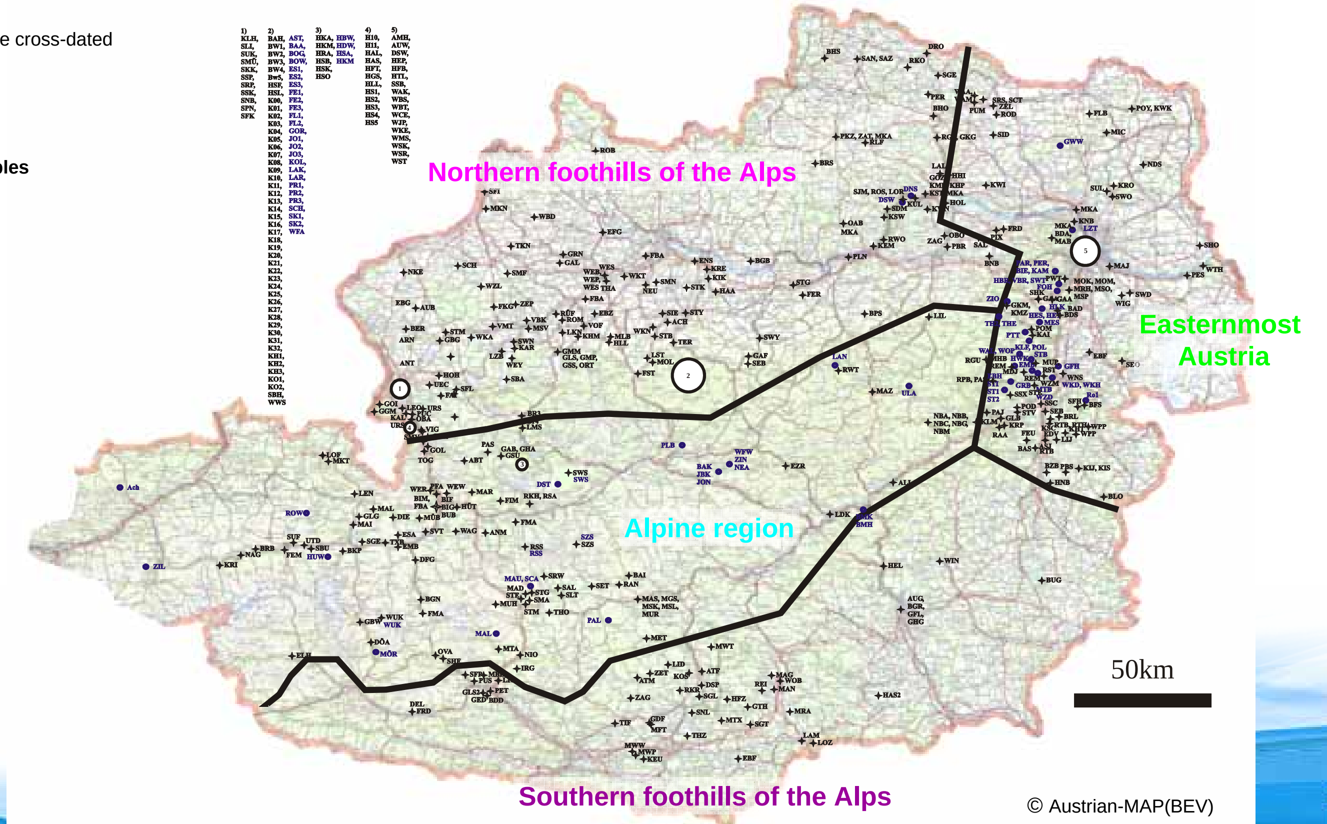


Figure 3: Distribution of the cross-dated tree-ring series

living trees

historical wooden samples



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SETTE CITTÀ

Dendroecological reconstruction of precipitation variability in the northern low mountain ranges, Germany

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The world-wide precipitation amount increased at about 2% within the 20th century due to a changing atmospheric circulation. The spatial and temporal variability of this increase is not completely understood. Hence, for a profound assessment of the impact of global change on the regional scale further spatial high resolved analyses are indispensable. These analyses can only benchmark the current precipitation patterns by using long-term reconstructions. These reconstructions should place recent changes in context of the previous environmental situation. Although earlier studies indicate that precipitation is a dominant growth-limiting factor at specific sites, only few attempts have been made in Central Europe to reconstruct precipitation from tree rings. Initial dendroecological investigations in the Rheinische Schiefergebirge confirm the strong influence of precipitation on growing-patterns of oaks and demonstrate that tree-ring/climate-relationships are not constant over time. In this study long and annually resolved tree-ring records will be used to estimate changes in precipitation variability over, at least, the last three centuries for the northern low mountain ranges in Germany and parts of some neighbouring countries. By combining recent and historical ring-width series, we intend to analyse the signals of both, temperature and precipitation on tree-ring growth in order to reconstruct precipitation patterns. A new methodological approach will be established, whereby we will consider the spatial and temporal variability of relationships between tree rings and climate. This approach combines dendroecological methods and multivariate statistics such as cluster analysis and GIS techniques. To include the spatial variability of precipitation patterns in the dataset a spatially high-resolved network of sites will be arranged for the entire study area. The reconstructions will present precipitation variability on different temporal scales, from interannual to multi-decadal.

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Synchronized tree-ring data from living trees (114 sites) and historical wooden samples (almost 500 objects) from Eastern Austria were split into four regions: Northern foreland of the Alps, the Alps, southern foreland of the Alps and easternmost Austria. The borders of these regions were defined by the forest eco-types, and the existing climatic regions (mainly precipitation) in Austria.
For all four regions master chronologies could be established. Chronologies of Norway spruce (*Picea abies* Karst.), fir (*Abies alba* Mill.) and larch (*Larix decidua* L.) are common in all regions. Setting up an oak- (*Quercus sp.*) chronology was possible in the north of the Alps, and for the most eastern region of Austria. At eastern Austria a pine (*Pinus nigra* L.; *Pinus sylvestris* L.) chronology was established. Likewise, a stone-pine (*Pinus cembra* L.) chronology was established for the alpine region. Each single chronology was crossdated against all others.
Bridging the period between roman (3rd century AD) settlements and existing wooden structures (10th century AD) was only possible by using subfossil logs that originated from alpine lakes and bogs.

Region	Fir	Spruce	Larch	Pine	Oak	Stone pine
North foreland	1242 - 1997	1061 - 1996	1602 - 1996		1291 - 1437	
Alps	1619 - 2003	958 - 2003	1475 - 1998			1162 - 2003
South Foreland	1225 - 1353	1322 - 1726				
Eastern Austria	977 - 1998	1287 - 1915	1508 - 1720	1237 - 2003	1172 - 2003	

Xylem formation in Norway spruce at two growth sites in Slovenia in years 2002 and 2003

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Cambial activity and xylem growth ring formation was studied in Norway spruce *(Picea abies)* with pinning technique in the vegetation periods 2002 and 2003. Experiment was performed at Alpine site Pokljuka (1250 m a.s.l.) and lowland plantation Sorsko polje (350 m a.s.l) at weekly intervals. Daily temperatures and amount of precipitation were recorded by weather stations located nearby both plots. The xylem increment was determined by investigation of permanent transverse sections stained with safranin and astra blue using a light microscope and an image analysis system. At Sorsko polje, the duration of the cambial activity was around 17 weeks (from the end of April until the end of August) in the year 2002 and 11 weeks (from the end of April until the end of July) in the year 2003. The onset of the cell divisions was comparable in both years, but the cessation of the cambial activity occurred considerably later in the year 2002. As a result, the xylem growth rings formed in the year 2002 were much wider (1.5-2.0 mm; 52-62 cells) than in the year 2003 (0.5-0.7 mm; 30-40 cells). Earlier cessation of the cambial activity can be explained by abnormally warm and dry summer in 2003. Sorsko polje is draught sensitive site and therefore the amount of precipitation seems to play the most important role in the duration, especially in the termination of the vegetation period. Hence, the differences in xylem growth ring widths could be due to higher amount of precipitation in the second part of the growing season, in the period of late wood formation in the year 2002. At Pokljuka, the growing season was around one week longer in the year 2002 (12-13 weeks; from the beginning of May until mid-August) than in the year 2003 (11 weeks; from mid-May until mid-August). The cambium initiated cell divisions earlier possibly because of higher air temperatures in spring 2002. The vegetation period of Norway spruce trees at Pokljuka is mainly limited by low temperatures. Late snow melting and lower air temperatures in spring 2003 could explain delay in the beginning of cambial activity. As a result of longer cambial activity in 2002, the xylem growth rings were a little broader (0.8-1.4 mm; 32-49 cells) comparing to the increment formed in the year 2003 (0.6-1.0 mm; 30-39 cells). In spite of the comparable duration of the cambial activity at Pokljuka and Sorsko polje in the year 2003, the xylem growth rings at the latter plot were significantly narrower. Supposing that the total xylem growth ring width is a sum of duration and dynamics of cell divisions in the cambium and radial expansion of the xylem cells, we can conclude that the rate of the wood formation was higher at Pokljuka reflecting in wider xylem growth rings. Growth of trees is sensitive to environmental conditions determining onset, duration, rate and cessation of the individual phases of xylogenesis.

Changes in the number of sapwood-rings on oak in Hungary

Andras Grynaeus

One of the most significant characteristics of the sapwood is that the number of its year-rings is constant within a given species and a given territory. While the tree thickens the sapwood contains always a constant number of year-rings at the edge