

Can tree rings of black pine (*Pinus nigra*) be used as a proxy for low flow?

Sandra Karanitsch-Ackerl¹

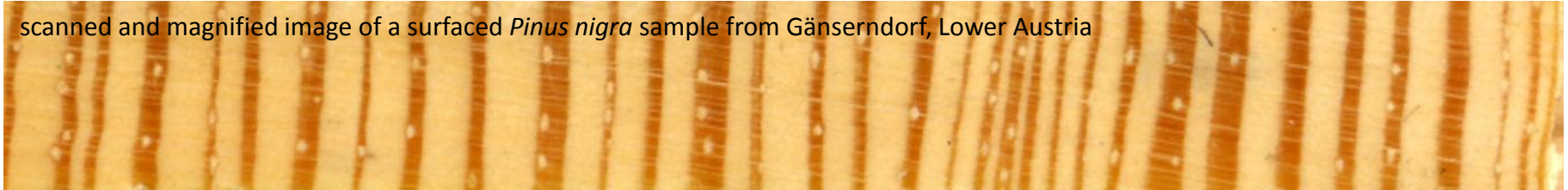
Michael Grabner¹

Gregor Laaha²

¹BOKU – Institute of Wood Science and Technology

²BOKU – Institute of Applied Statistics and Computing

scanned and magnified image of a surfaced *Pinus nigra* sample from Gänserndorf, Lower Austria



Pinus nigra at Markhof, Lower Austria

tree rings – dendrochronology

scanned and magnified image of a surfaced *Pinus nigra* sample from Gänserndorf, Lower Austria

$$R_t = A_t + C_t (+ C_{t-1}) + D_t + E_t$$

R ringwidth (earlywood or latewood width)

t year of ring formation

A age trend

C climate

D disturbance

E error



Pinus nigra at Markhof, Lower Austria

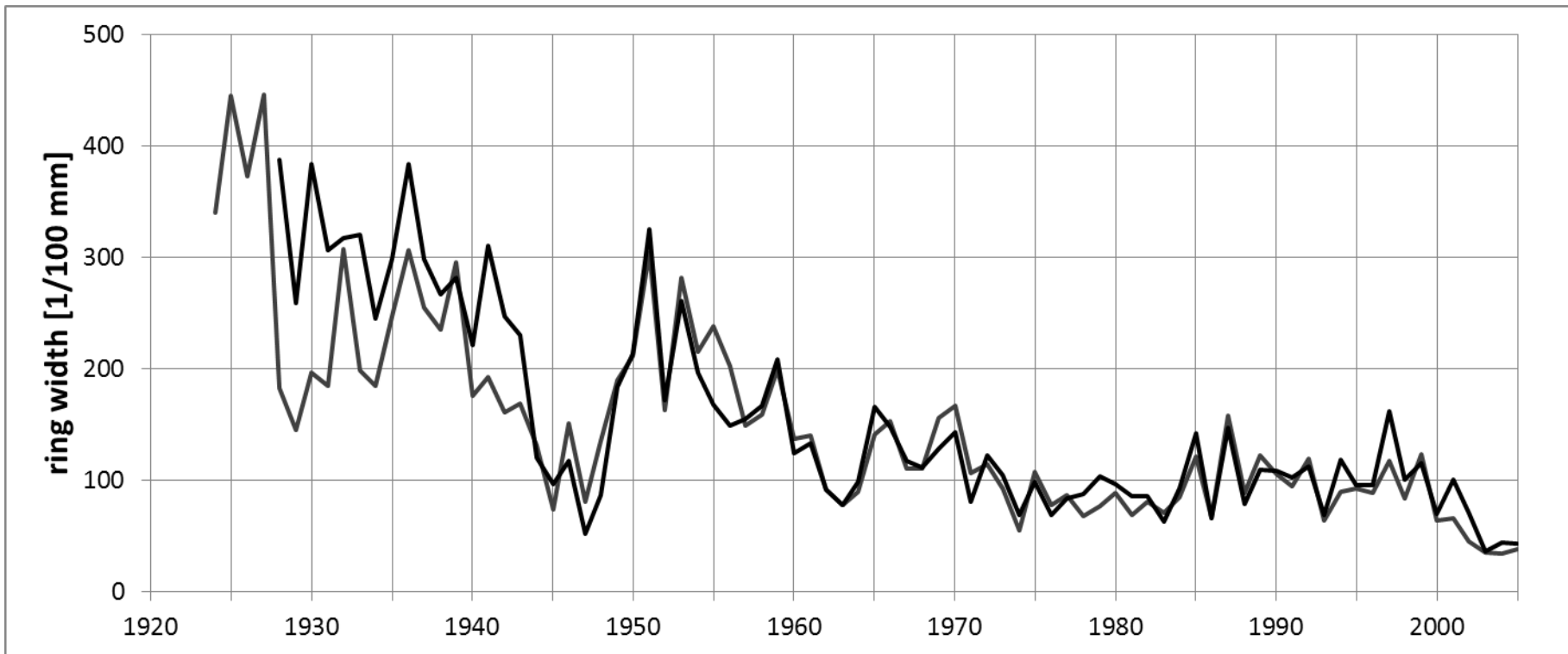
modified from:

COOK E. R. (1990) A Conceptual Linear Aggregate Model for Tree Rings. In: Methods of Dendrochronology. Applications in the Environmental Sciences. E. R. COOK und L. A. KAIRIUKSTIS (eds.) Dordrecht, Boston, London. Kluwer Academic Publishers.

tree rings – detrending

scanned and magnified image of a surfaced *Pinus nigra* sample from Gänserndorf, Lower Austria

$$R_t = A_t + C_t (+ C_{t-1}) + D_t + E_t$$

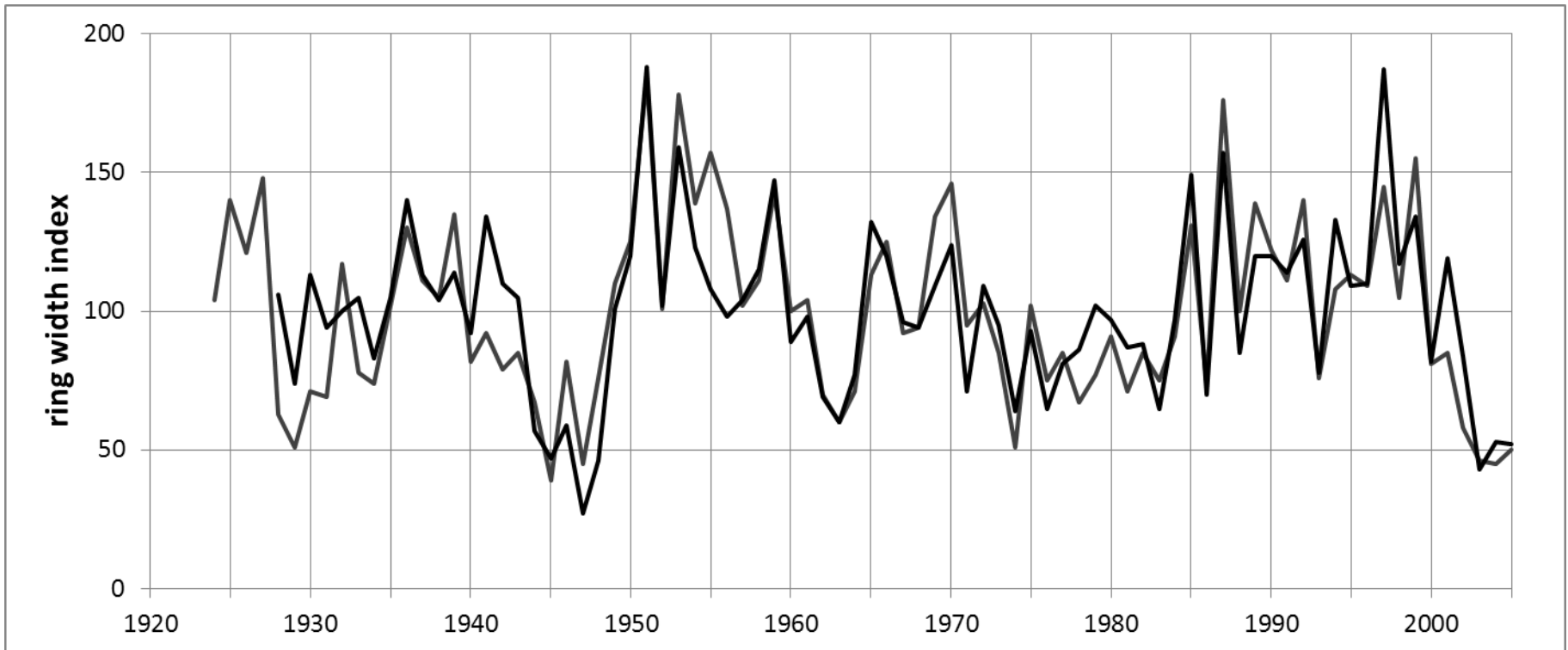


measured ring widths of two samples from one *P. nigra* tree in Gänserndorf

tree rings – detrending

scanned and magnified image of a surfaced *Pinus nigra* sample from Gänserndorf, Lower Austria

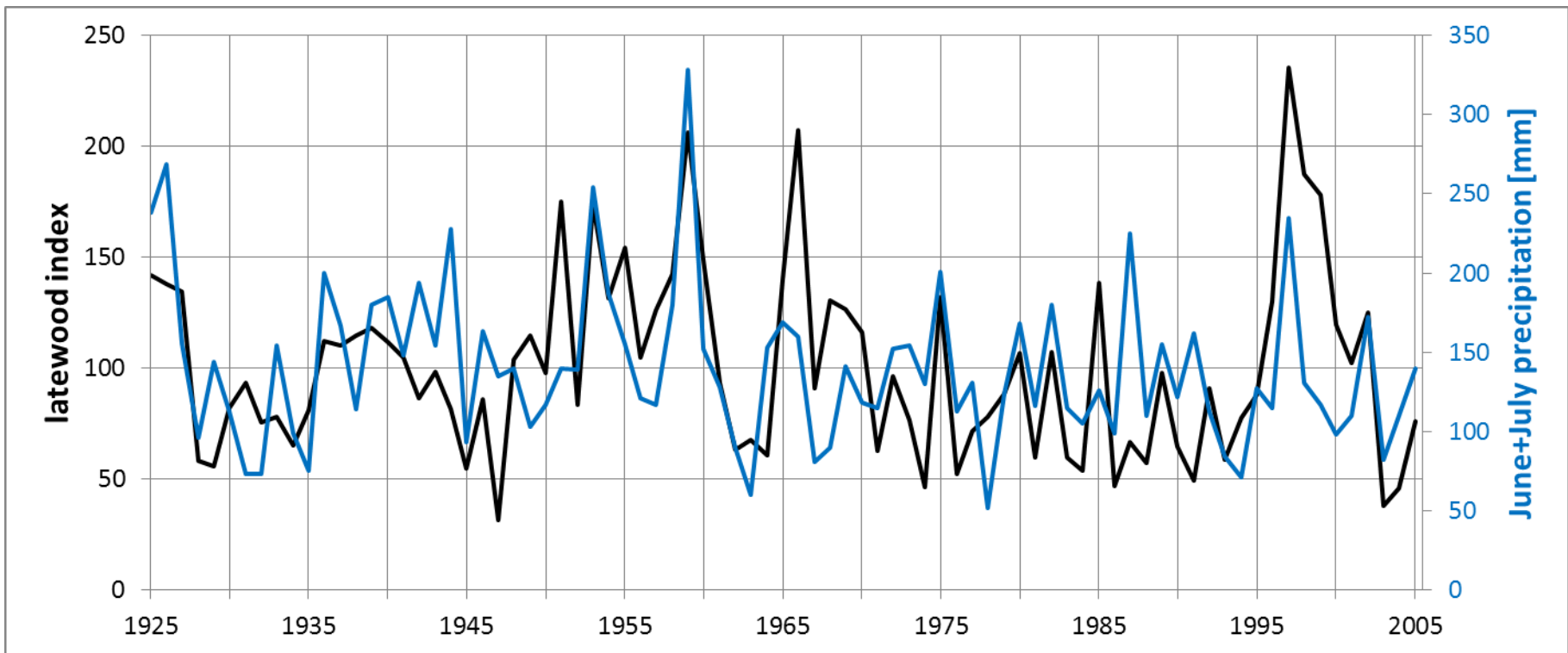
$$R_t = A_t + C_t (+ C_{t-1}) + D_t + E_t$$



standardized ring widths of two samples from one *P. nigra* tree in Gänserndorf

scanned and magnified image of a surfaced *Pinus nigra* sample from Gänserndorf, Lower Austria

$$R_t = A_t + C_t (+ C_{t-1}) + D_t + E_t$$

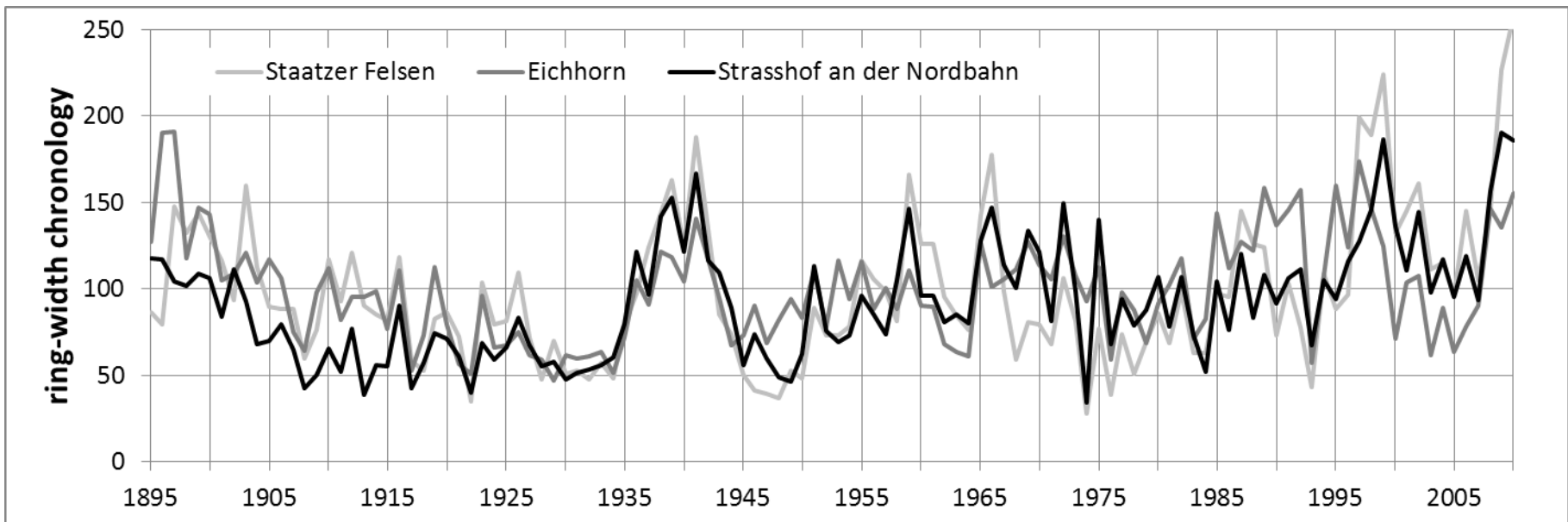


P. nigra site chronology Gänserndorf, [June and July precipitation Retz](#)

tree rings – crossdating

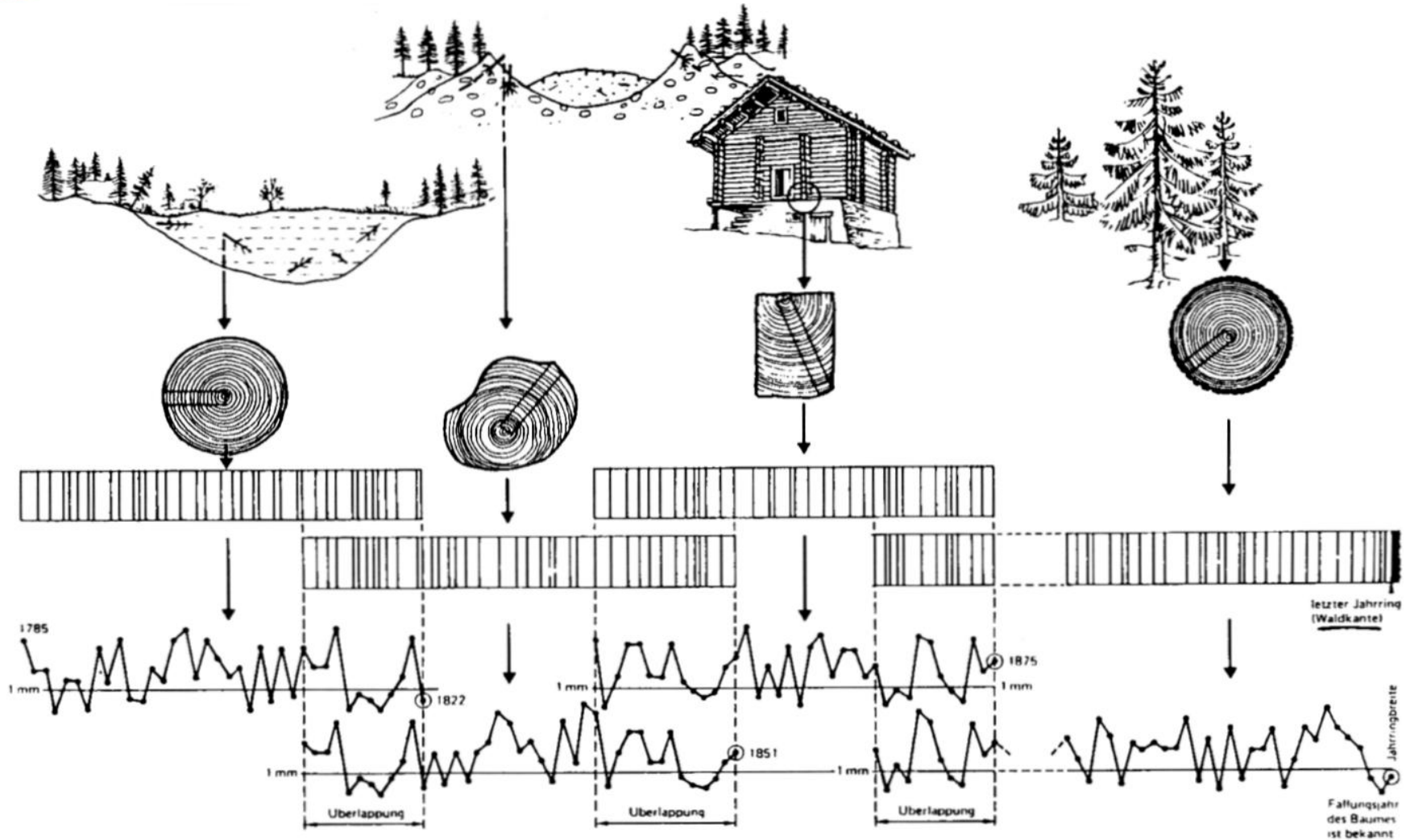
scanned and magnified image of a surfaced *Pinus nigra* sample from Gänserndorf, Lower Austria

$$R_t = A_t + C_t (+ C_{t-1}) + D_t + E_t$$



ring-width chronologies for three different *P. nigra* sites in Lower Austria

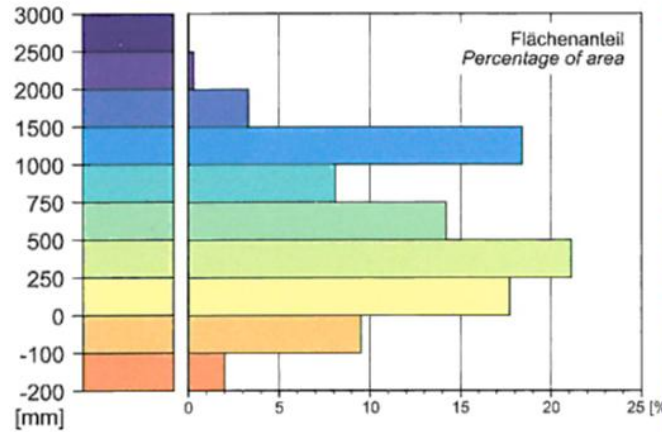
tree rings – chronology building



from:
 SCHWEINGRUBER F. H. (1983) Der Jahrring. Standort, Methodik, Zeit und Klima in der Dendrochronologie. Verlag Paul Haupt. Bern, Stuttgart. page 85.

Weinviertel – climate

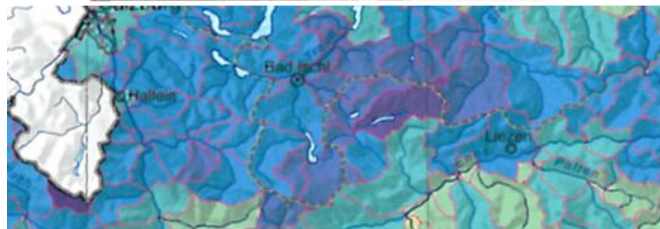
Klimatische Wasserbilanz
Climatic water balance



Teileinzugsgebietsgrenzen
Sub-basin divides

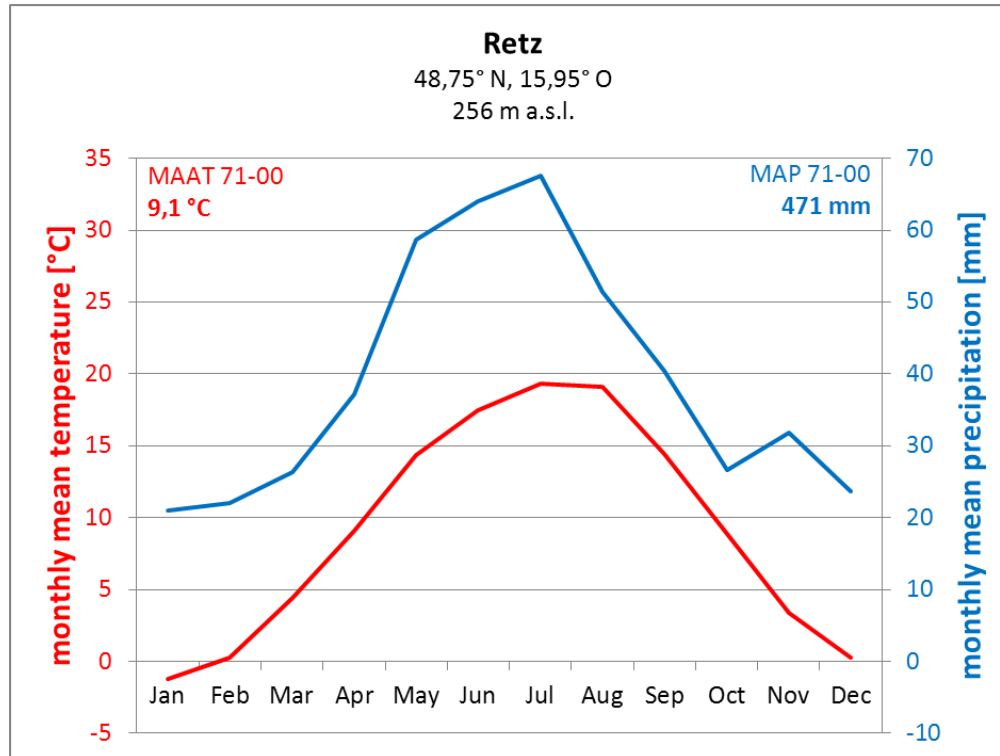
1 : 2 000 000

20 0 20 40 60 80 km



modified from:
Austrian Federal Ministry of Agriculture and Silviculture, Environment and Water Management (2005) Hydrological Atlas

Weinviertel – climate



modified from:
Austrian Federal Ministry of Agriculture and Silviculture, Environment and Water Management (2005) Hydrological Atlas



question

**Can tree rings of black pine (*Pinus nigra*)
be used as a proxy for low flow?**

Can tree rings of black pine (*Pinus nigra*) be used as a proxy for low flow?

- tree rings and low flow depend on precipitation
- dendrohydrology

tree-ring data

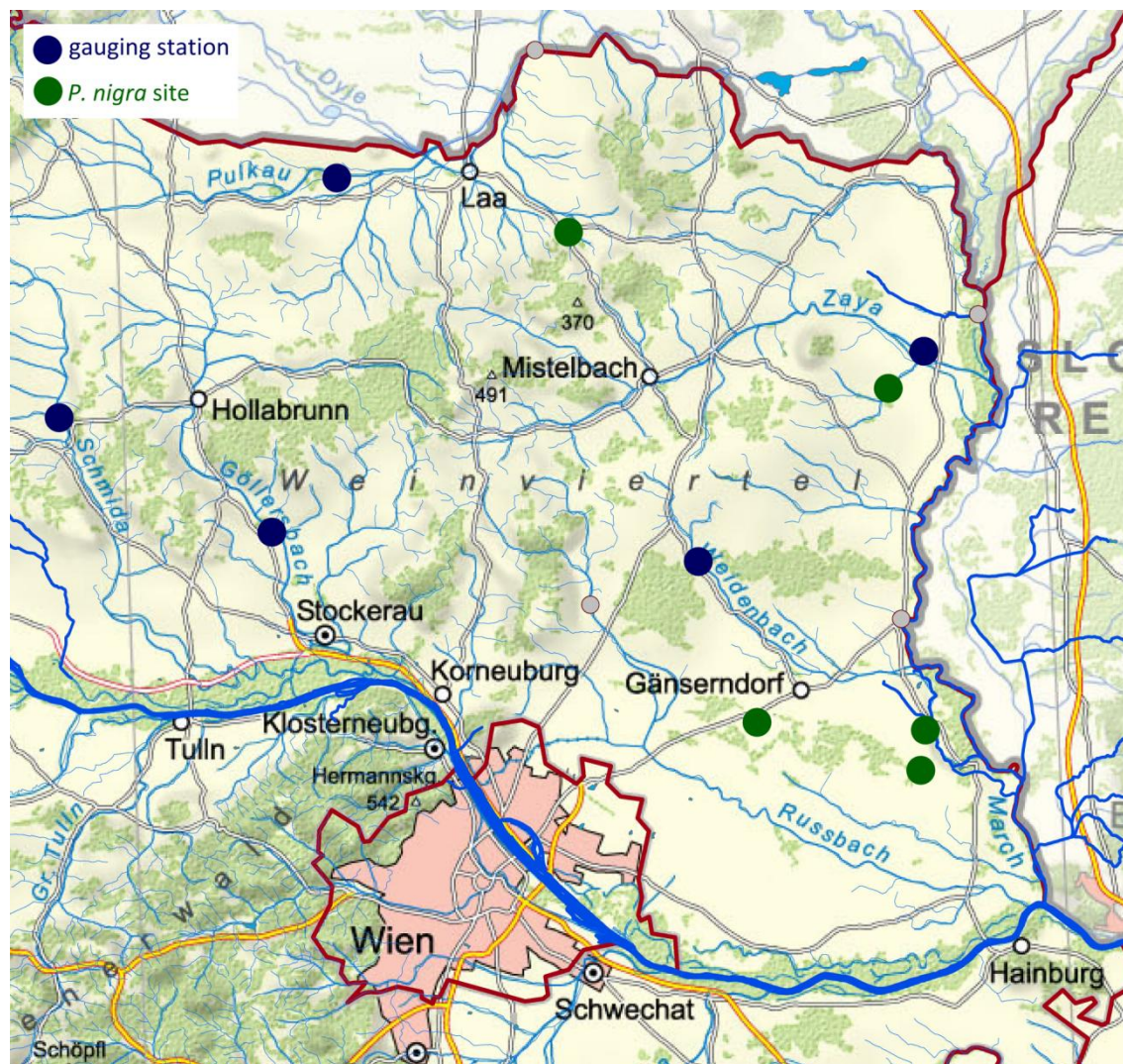
earlywood, latewood, ring width

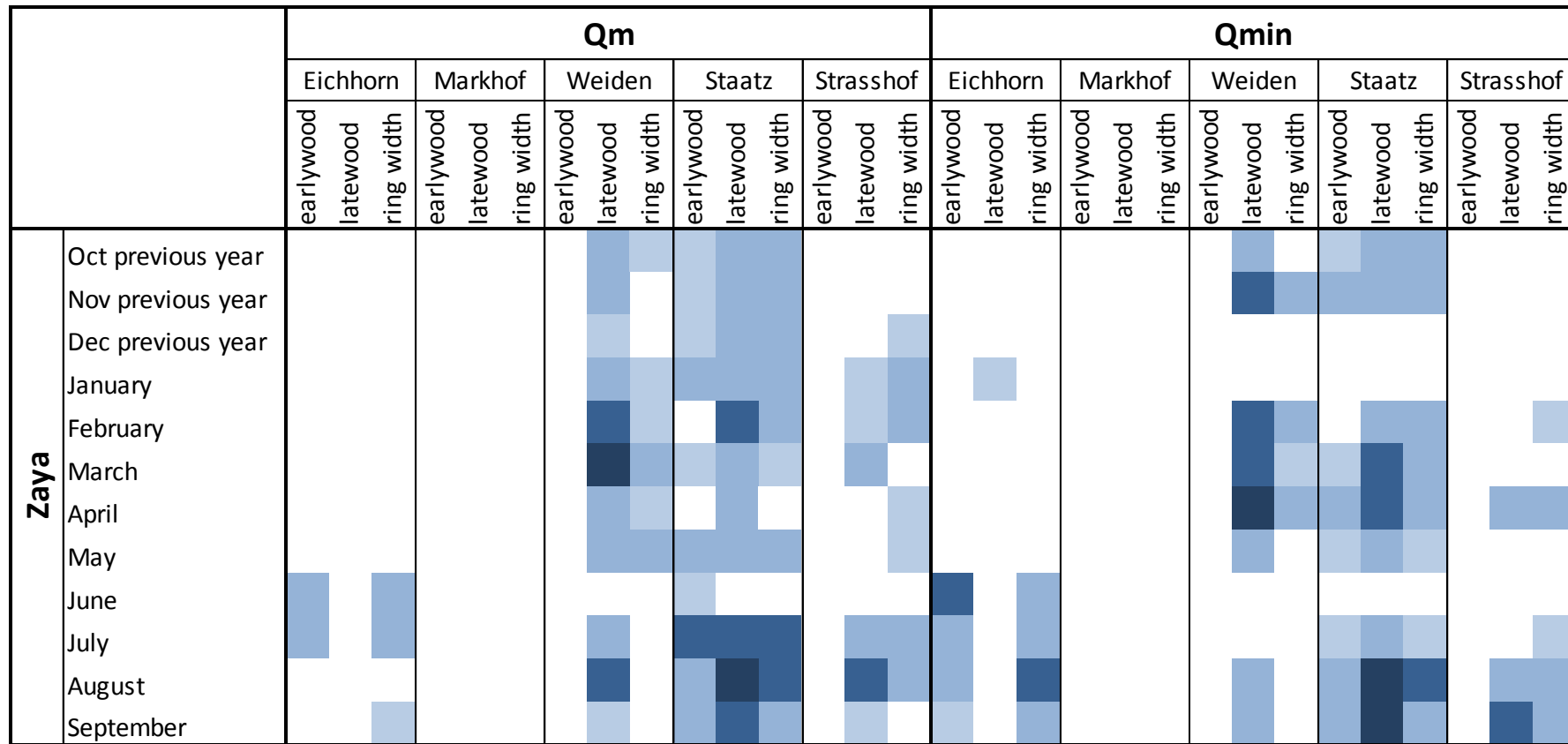
Eichhorn	1895-2010
Markhof	1852-2009
Oberweiden	1943-2009
Staatzer Felsen	1894-2011
Strasshof	1879-2011

runoff data

Qm (monthly mean), Qmin (monthly minimum)

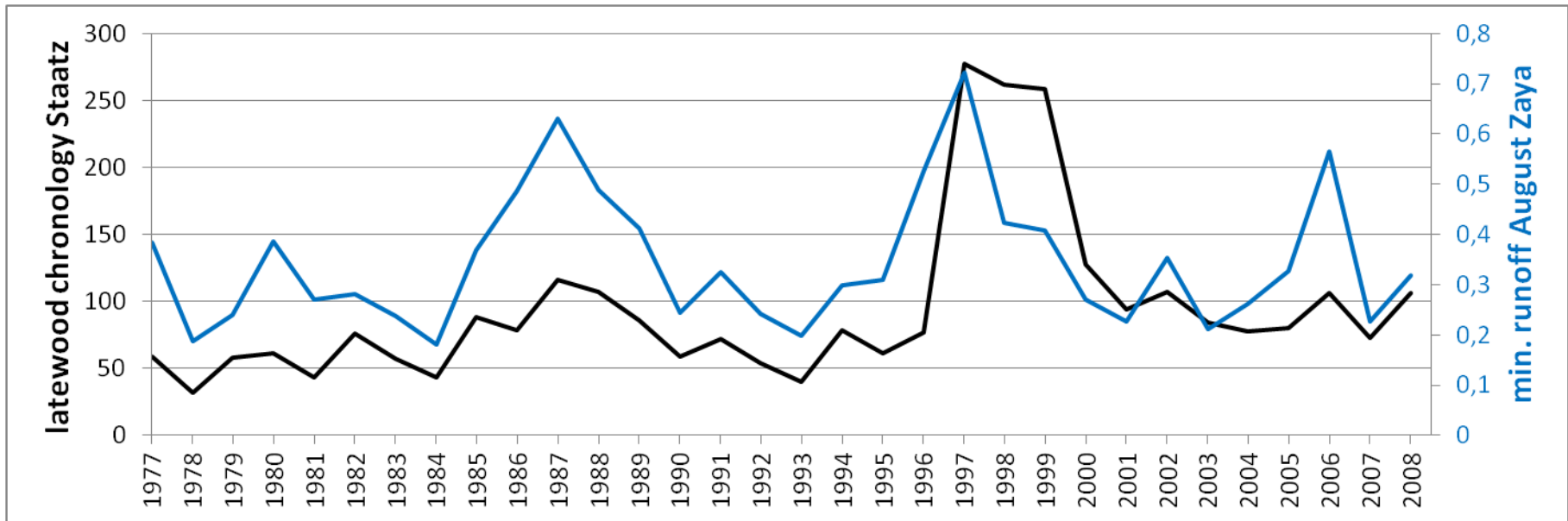
Schmida	1976-2008
Göllersbach	1976-2008
Pulkau	1976-2008
Weidenbach	1976-2008
Zaya	1977-2008





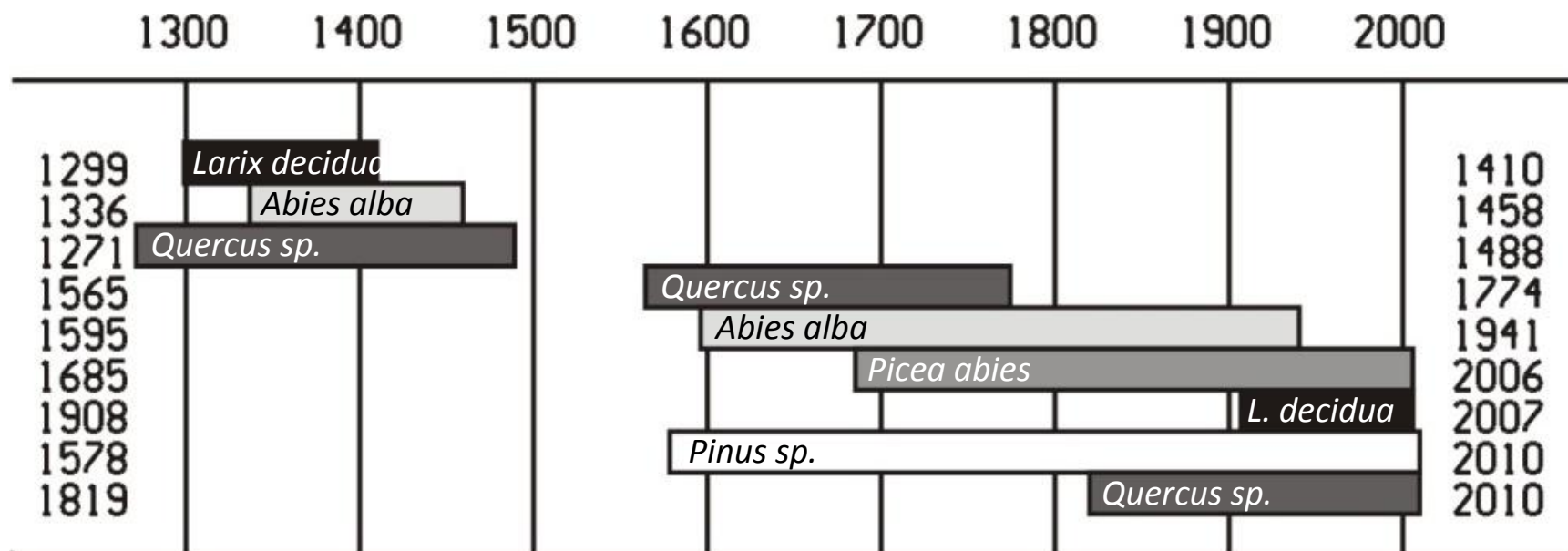
significant results for SPEARMAN correlation coefficients



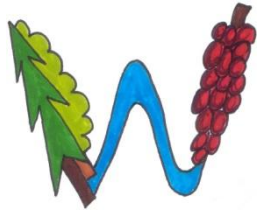


- tree rings can be a proxy for runoff
- potential for reconstructing low flow in the past

Weinviertel – chronologies



Thank you for your attention!



Sandra Karanitsch-Ackerl
sandra.karanitsch@boku.ac.at
www.wald-wasser-weinviertel.at

supported by

Austrian Federal Ministry of Science and Research, SPA03-15 **WALD-WASSER-WEINviertel**

hydrological data provided by Hydrographic Service Austria

climate data provided by Central Institute for Meteorology and Geodynamics Austria