Abstract Book

OF

EURODENDRO 2005

International Conference of Dendrochronology

SEPTEMBER, 28TH – OCTOBER 2ND

VITERBO, ITALY

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SETTE CITTÀ

an increasing in eccentricity was found progressing from the pit to the bark and abrupt growth reductions have been rarely recognized.
This different trees reaction to the wind action can be related to the structure of the woods and the geomorphological settings. In the rocky coast sites the presence of a well-developed shrubs layer acts as a barrier against the direct effect of wind on tree trunks. On contrary, in the coastal plain the wind can flow and spread against the entire trunk, being the trees community even-aged and mostly at the same height level.

Dating of pine timber from historical buildings in Lithuania

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Thirty samples from Scots pine (*Pinus sylvestris* L.) timber taken from historical buildings of Lithuania were precisely dated and together with living pines used for construction of the long-term chronology. Samples were taken from churches, monasteries and estates located in the central – Kaunas region (Kaunas Karmelitai Church, Kaunas Jezuitai Church, Kaunas City Hall, Aukstoji Freda Estate, Zapyskis Church and Skaruliai Church) and eastern – Vilnius region of Lithuania (Vilnius Evangelikai Reformatai Church, Vilnius Benediktines Church, Vilnius Benediktines Monastery, Vilnius Sv. Mykolas Church, Vilnius Trinitoriai Monastery, Vilnius Cathedral and Vilnius City Hall).
The most valuable material – samples containing more than 100 rings mainly are from old churches and monasteries in Vilnius region. For the dating of younger samples we used two chronologies compiled from living pine trees: Vingis Park – 24 trees (1673-1989) from Vilnius and Panemune Silas – 8 trees (1783-2002) from Kaunas. These two chronologies show very similar radial growth patterns. For the dating of older material, especially from Vilnius churches, we used successfully two long-term pine chronologies: Dannenstern House from Latvia by dr. Maris Zunde (1445-1740) and Polpinus-5 from Poland by dr. A. Zielski (1106-1991). Dating results showed that the pine timber material mainly used in the constructions of Lithuanian Churches and Monasteries is from middle of the 17th century up to middle of the 19th century. This means that the material from older periods is quite almost lost during the war fires in the middle ages and the biggest amount of taken samples are representatives of the reconstruction works.
As a result of the dating work a long-term pine chronology containing 516 rings and spanning 1487-2002 was compiled. Chronology shows strong trans-regional signal – high similarity with the chronology of Dannenstern House ($t = 7.7$) and Polpinus-5 ($t = 6.6$).
Pointer year analysis on the radial growth of dated samples was also carried out. Negative pointer years were established in 1557, 1599, 1619, 1629, 1659, 1762, 1811, 1865, 1889, 1896, 1940 and 1979 and positive in 1559, 1602, 1611, 1656, 1723, 1779, 1866, 1910, 1978 and 1982. Interpretation and further analysis of the older events before the regular meteorological observations could give a valuable information on climate anomalies in Lithuania and neighbouring countries.

Studying radial and axial variation of stable isotopes within a single oak tree

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Due to carry-over effects of reserve-substances, i.e. carbohydrates, in oak wood, isotopic studies covering an area of 30-350 m^2 three height classes (<50 cm, 51-200 cm, >200 cm) were sampled by taking stem disks at the soil surface (n ≥5 trees per height class). Additionally, seedling density was determined and evolution of the clearing was analyzed by taking increment cores (2 radii/tree) from several dominant trees surrounding selected gaps. Total ring width chronologies were established and climate influence determined by evaluation of growth response to long- and short-term climate variability.

Based on repeated growth recoveries detected in dominant trees, formation of clearings are traced back to successive canopy openings due to tree death. Accordingly, regeneration occurred over a time period of one to two decades, but always started during first years of gap formation. Extreme environmental conditions within the study area, like nutrient deficiency and shallow soils with low water holding capacity, are reflected in strikingly limited shoot and radial growth of young trees of 2 cm and 0,1 mm a^{-1}, respectively. Furthermore, seedling density reached 2-4 seedlings m^{-2}, which is far lower than natural seedling densities reported from more favourable sites (up to 50 seedlings m^{-2}).

Although long-term radial growth of dominant 120-170 yr old trees surrounding gaps is primarily limited by precipitation in spring (March-May) and distinct growth reductions were detected in drought years (e.g., 1976), evidence is provided that radial growth of young trees below the canopy (tree height <2 m; tree age 15-40 yr) is not controlled by amount of spring precipitation until (*i*) tree canopy is coupled to atmospheric conditions, i.e., influence of wind and air humidity on transpiration rates, and/or (*ii*) a successively rising water demand with increasing tree size occurs.

Impact of wind on trees: differences between a rocky coast and a coastal plain

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Effects of wind on trees depend on its velocity and its persistence, while trees susceptibility to wind action varies with their height, size and age. High velocity winds produce damages if not the uprooting or breaking of trees. Constant winds, flowing almost on the same directions, produce modifications to the trees structure.

The aim of our study was to investigate on the impact of wind on trees growing on a part of the Italian coast which is characterized by a sharp transition from the rocky cliffs to a coastal plain. We sampled trees on ten sites, starting from the rocky coast (6 sites) between Lerici and Bocca di Magra (Provincia di Spezia, Italy), characterized by steep slopes, and progressing to the coastal plain sites (4) between Marinella di Sarzana (Provincia di Spezia, Italy) and Marina di Massa (Provincia di Massa Carrara, Italy). For each site we sampled from a minimum of three to a maximum of ten trees, depending on their frequency and distribution. On the rocky coast, belonging to the Caprione promontory, we sampled the Aleppo pines (*Pinus halepensis* Mill.). They are grouped specimens on a mixed wood, formed by *Quercus ilex* L. and a wide variety of shrubs belonging to the Mediterranean macchia. On the coastal plain trees are Maritime pines (*Pinus pinaster* Ait.) forming pure stands almost directly facing the seaside. A reference chronology was performed by the cross dating of growth curves from twenty Aleppo pines, which are located on a gently slope area in the upper Caprione promontory, just above the rocky coast.

The results of this analysis clearly show the different response between trees located on the two types of coast. On the rocky coast sites, trees do not grow eccentrically nor develop flag-shape crowns. Abrupt growth reductions lasting several years have been found in some grouped trees, always producing thin rings all around the trunks. On the coastal plain trees are mainly leaning in the wind directions, showing an elliptical crown developed on the same directions. The internal structure of these trees reflects the external shape:

Studying radial and axial variation of stable isotopes within a single oak tree

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Material and Methods:

site

tree

wood

preparation methods

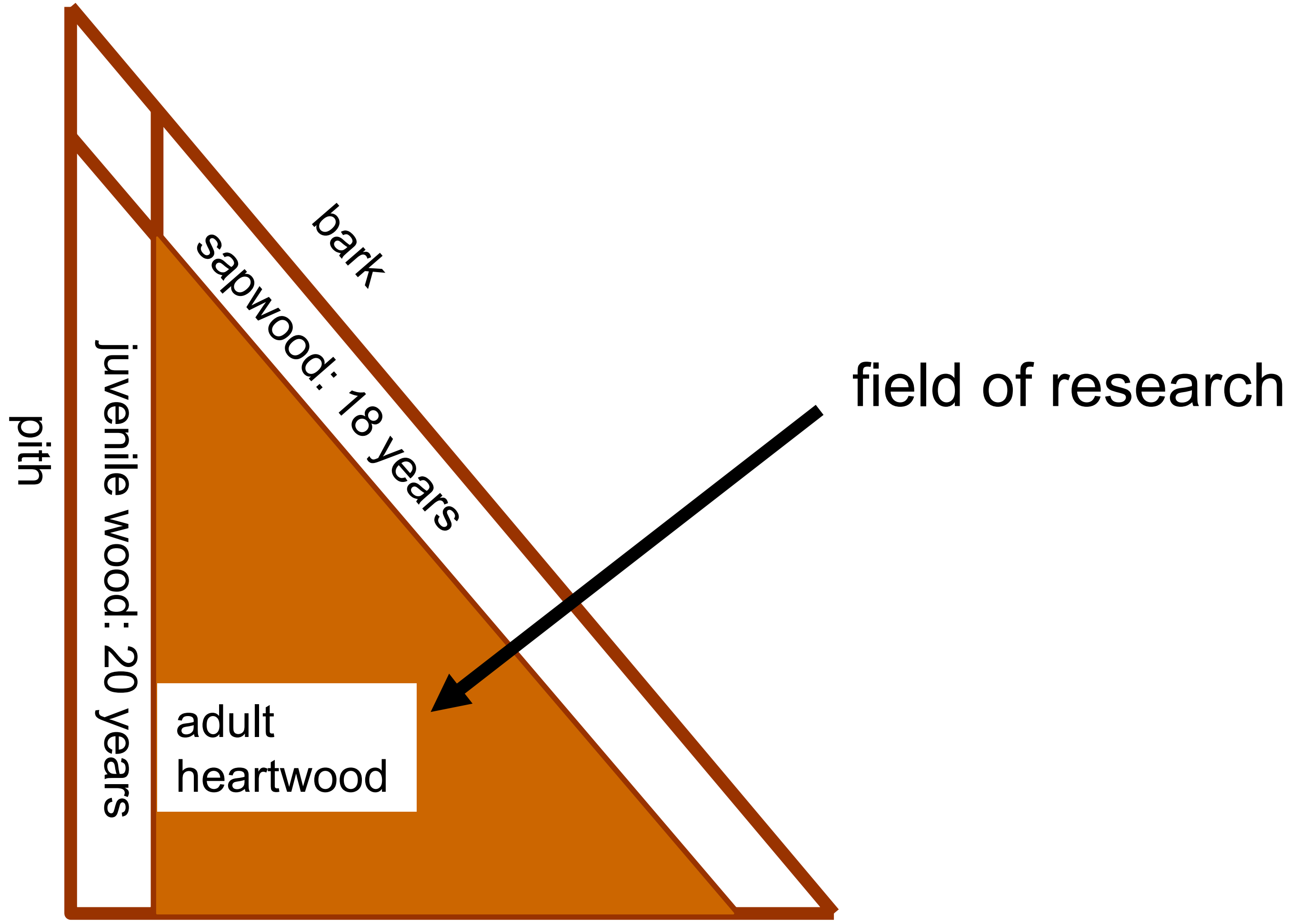
sampling heights

site and tree

- Lainzer Tiergarten (Vienna, Austria)
- 48°11‘28“N, 16°12’26“E
- 300 m asl
- dry, poor and flat
- mainly oak

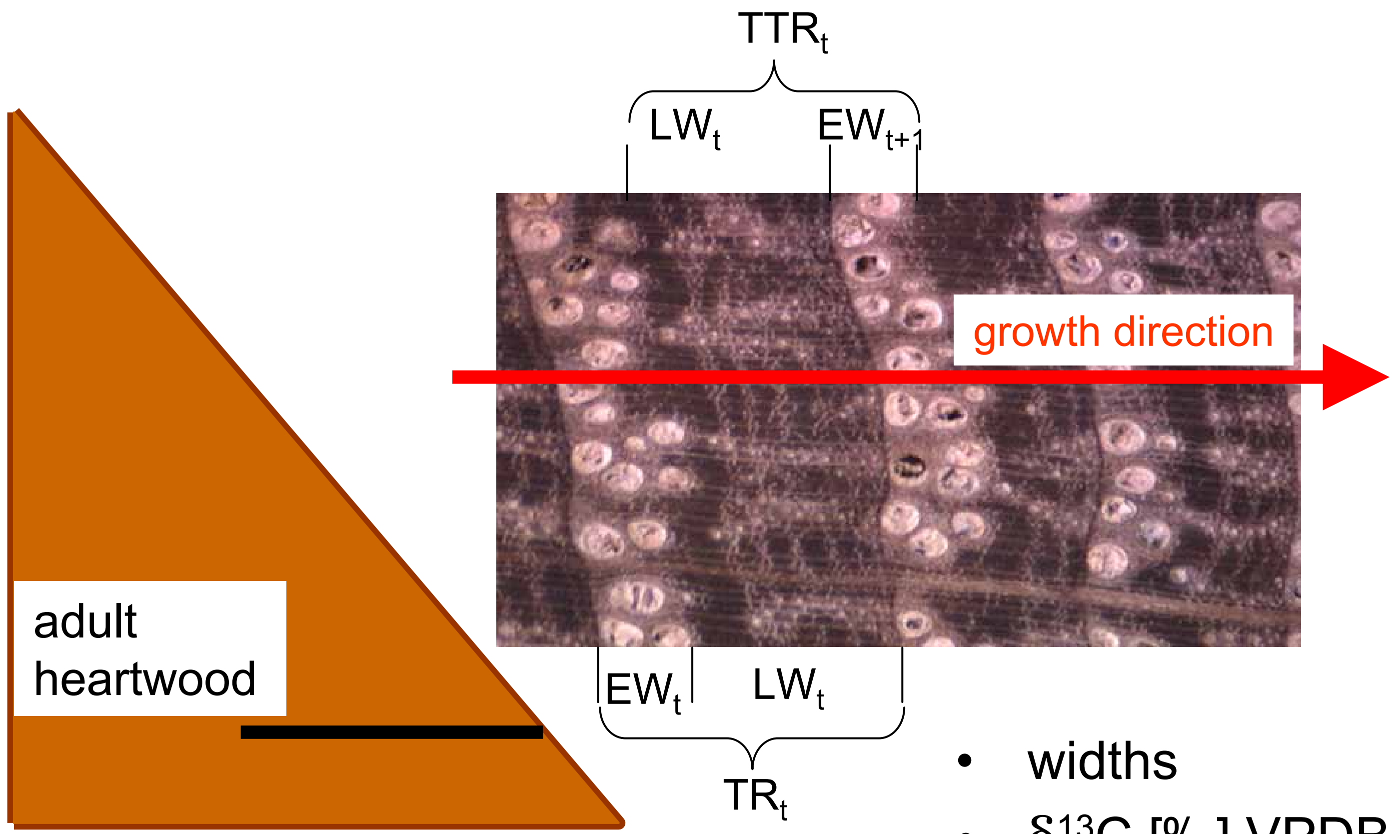
- Quercus petraea
- dominant
- 145 years
- height >30 m

wood


bark
sapwood: 18 years
pith
juvenile wood: 20 years
adult
heartwood
field of research

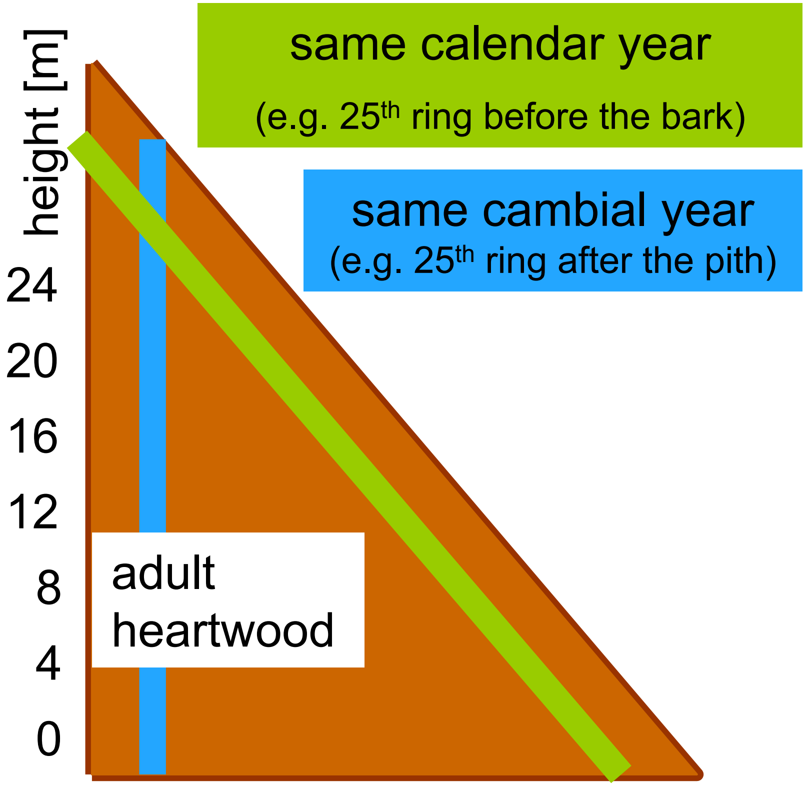
preparation methods

sequence of 50 years at 4 m height → 4 tree ring components
(1936-1985)



- widths
- $\delta^{13}C$ [‰] VPDB
- $\delta^{18}O$ [‰] VSMOW

sampling heights



discs stepwise taken each 4 m

↓

sequence of 10 years of same calendar year

+

sequence of 10 years of same cambial year

↓

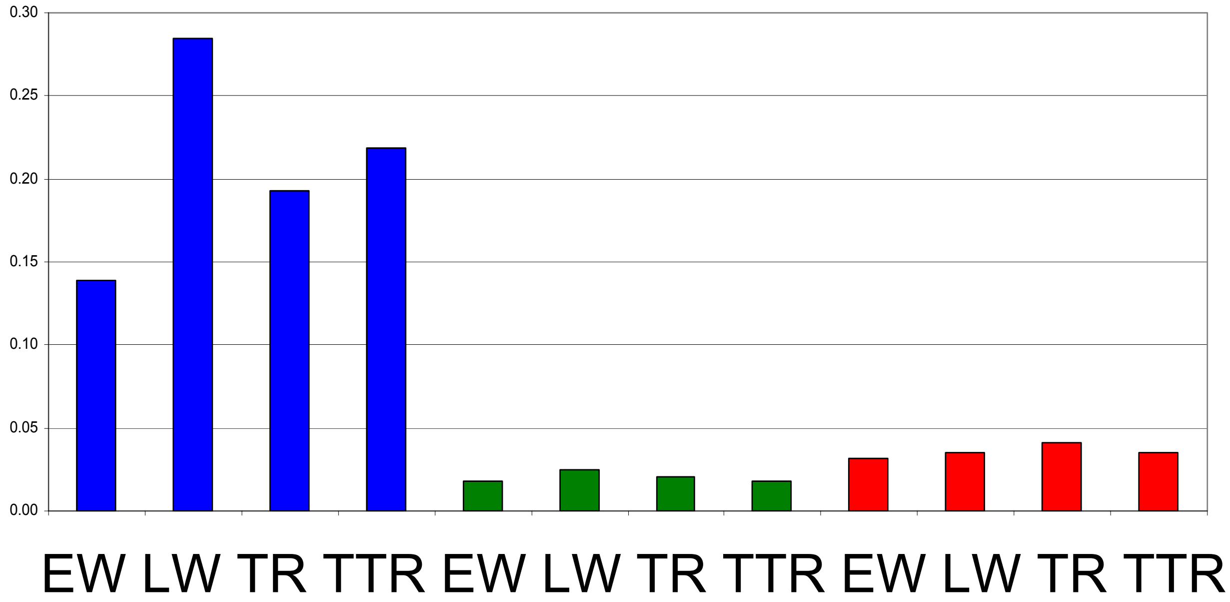
widths, $\delta^{13}C$ and $\delta^{18}O$ on LW

Results:

radial variations (preparation methods)

axial variations (sampling heights)

radial variations

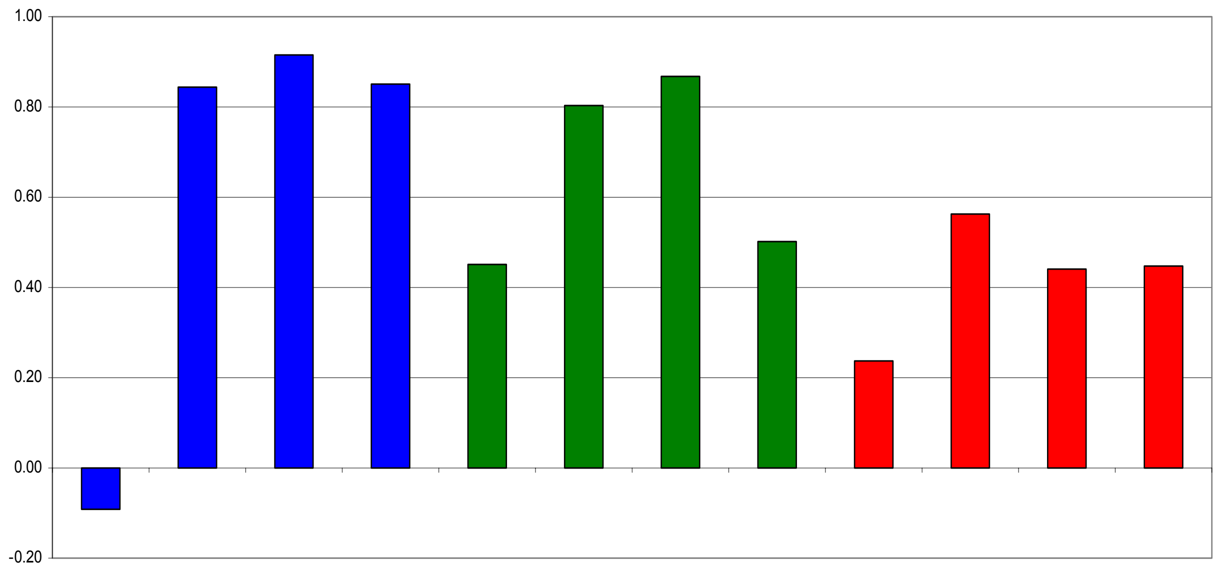


mean sensitivity

widths

$\delta^{13}C$

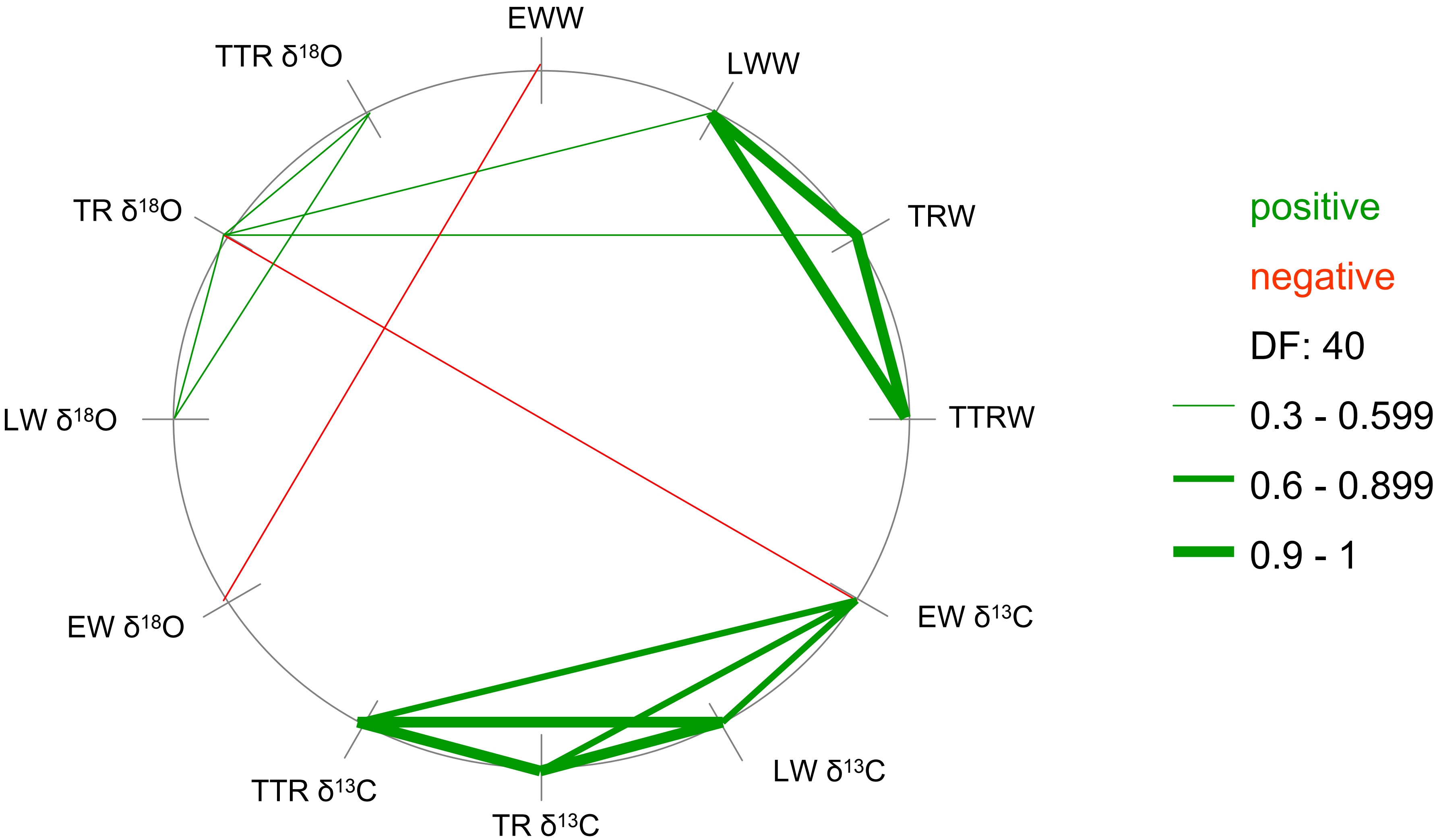
$\delta^{18}O$



correlation with master

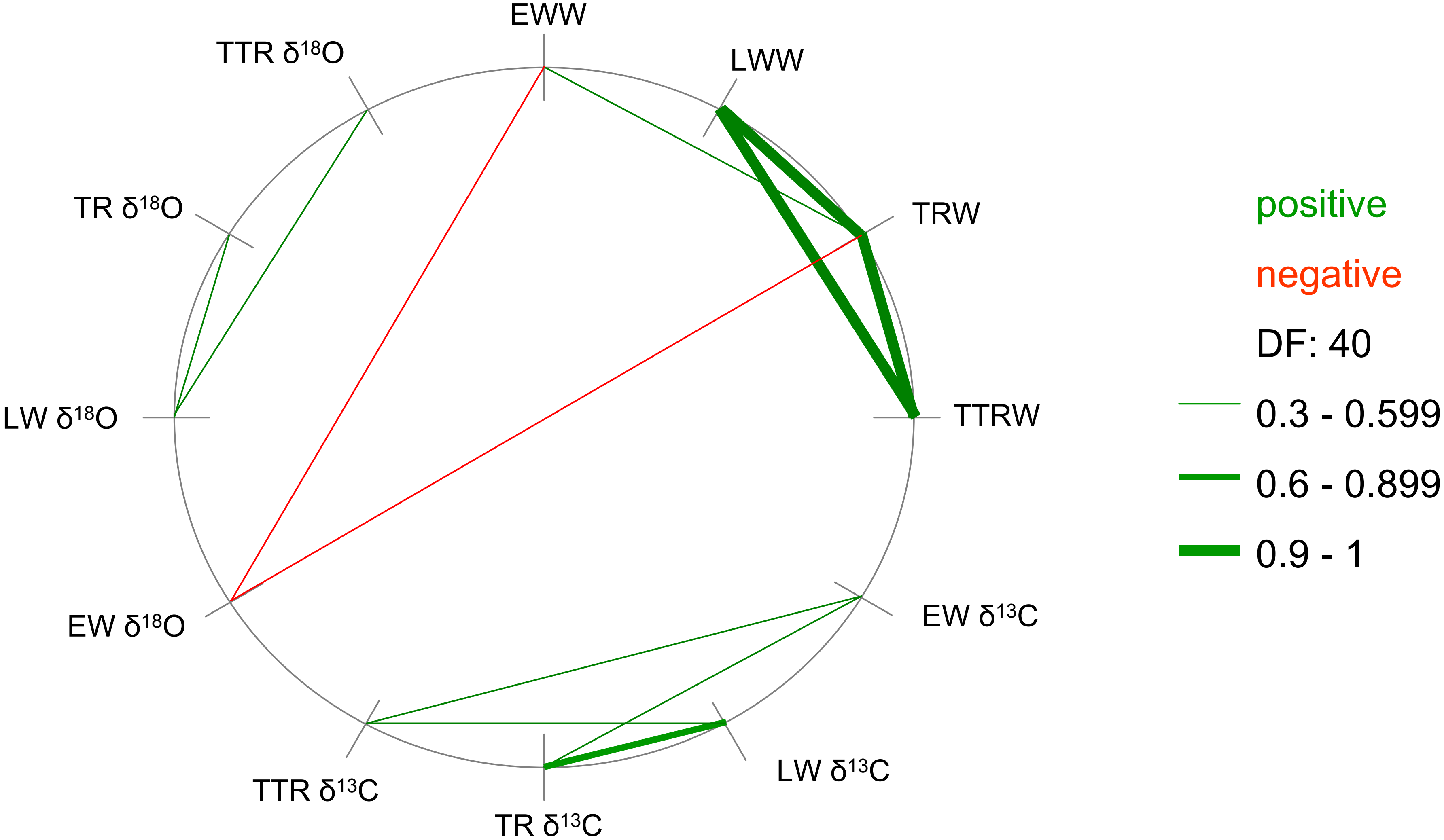
radial variations

simple correlations (r)



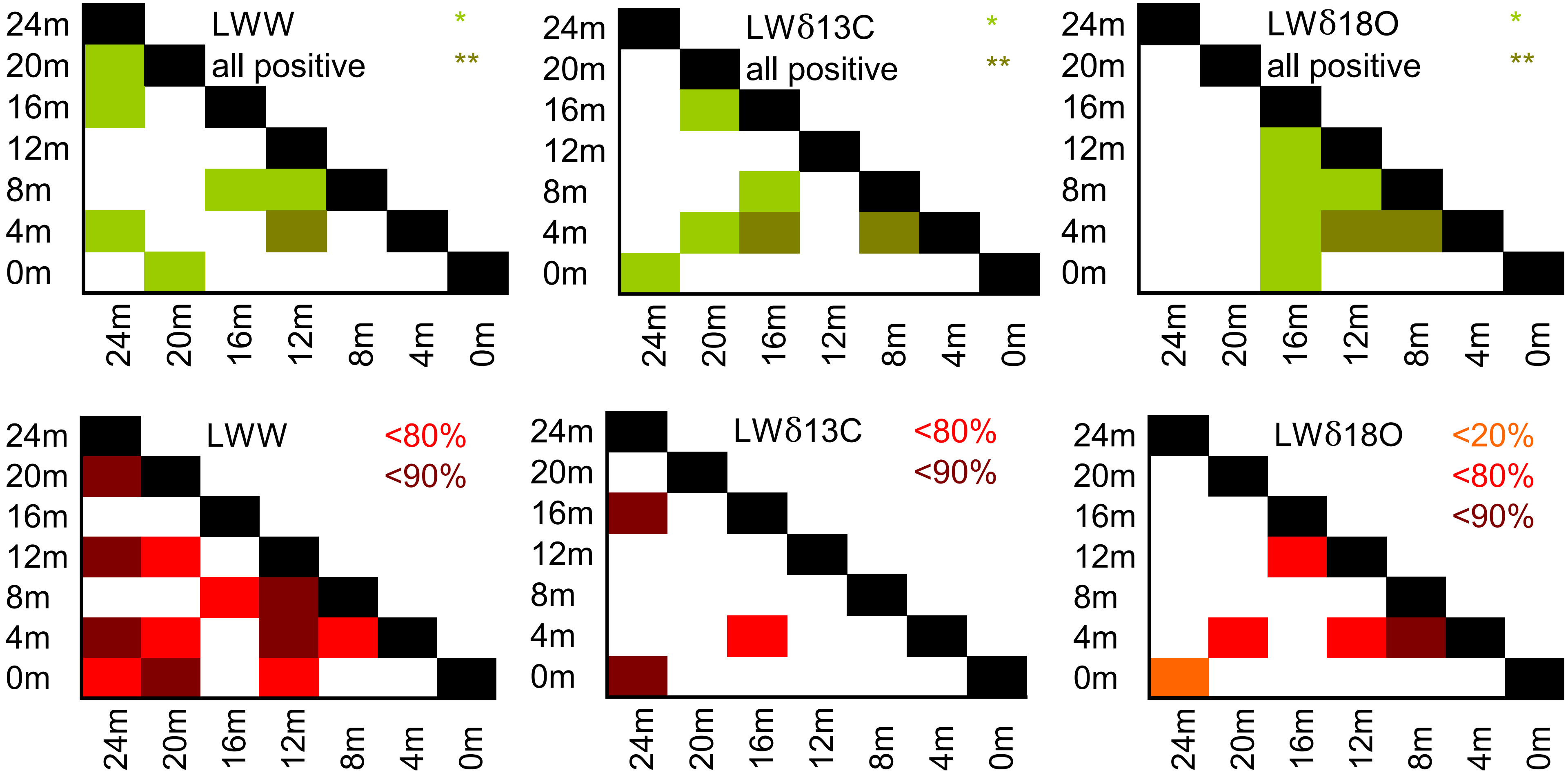
radial variations

partial correlations (r)



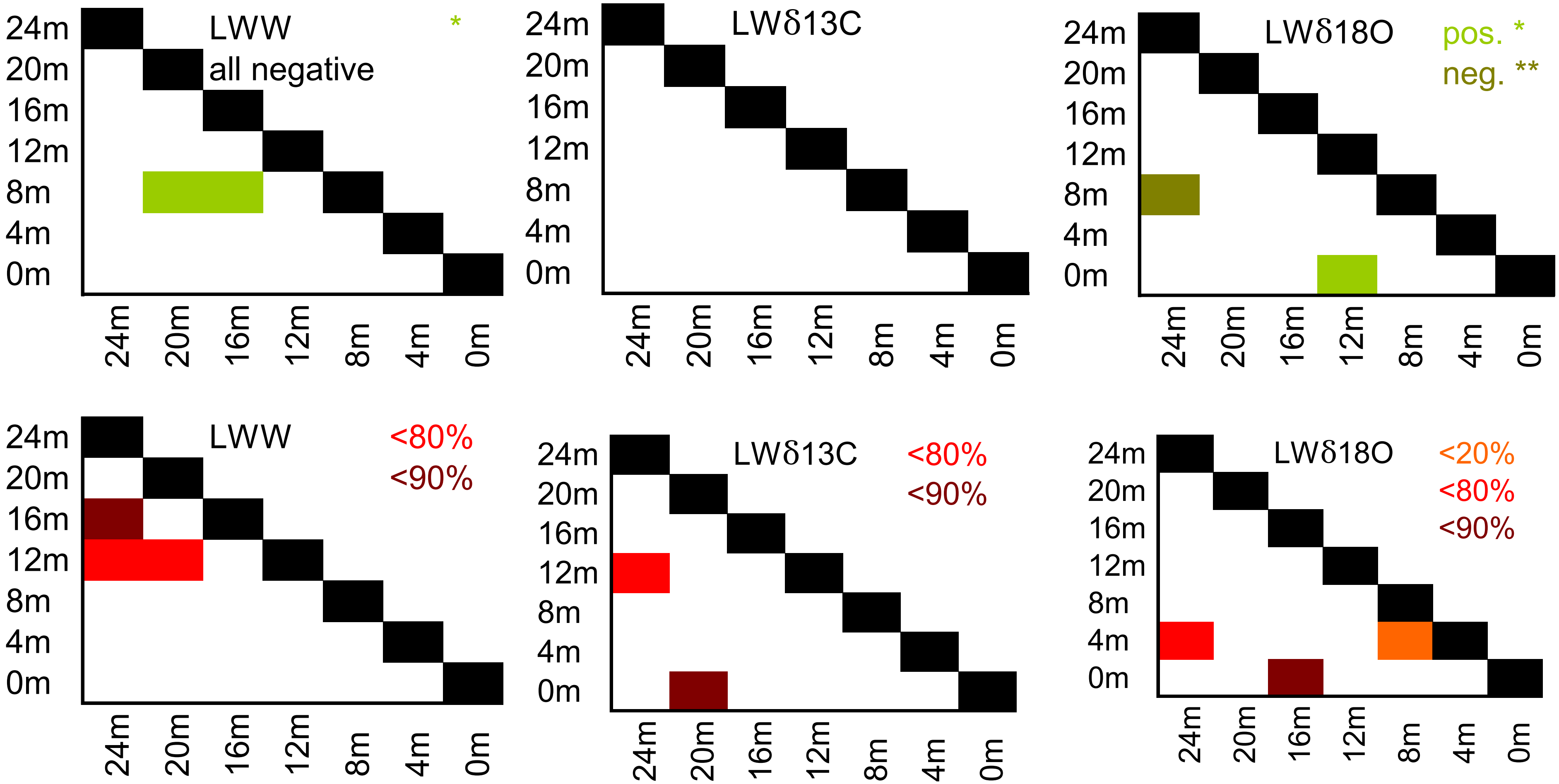
axial variations - calendar year

simple correlations   Gleichlaeufigkeit



axial variations - cambial year

simple correlations   Gleichlaeufigkeit

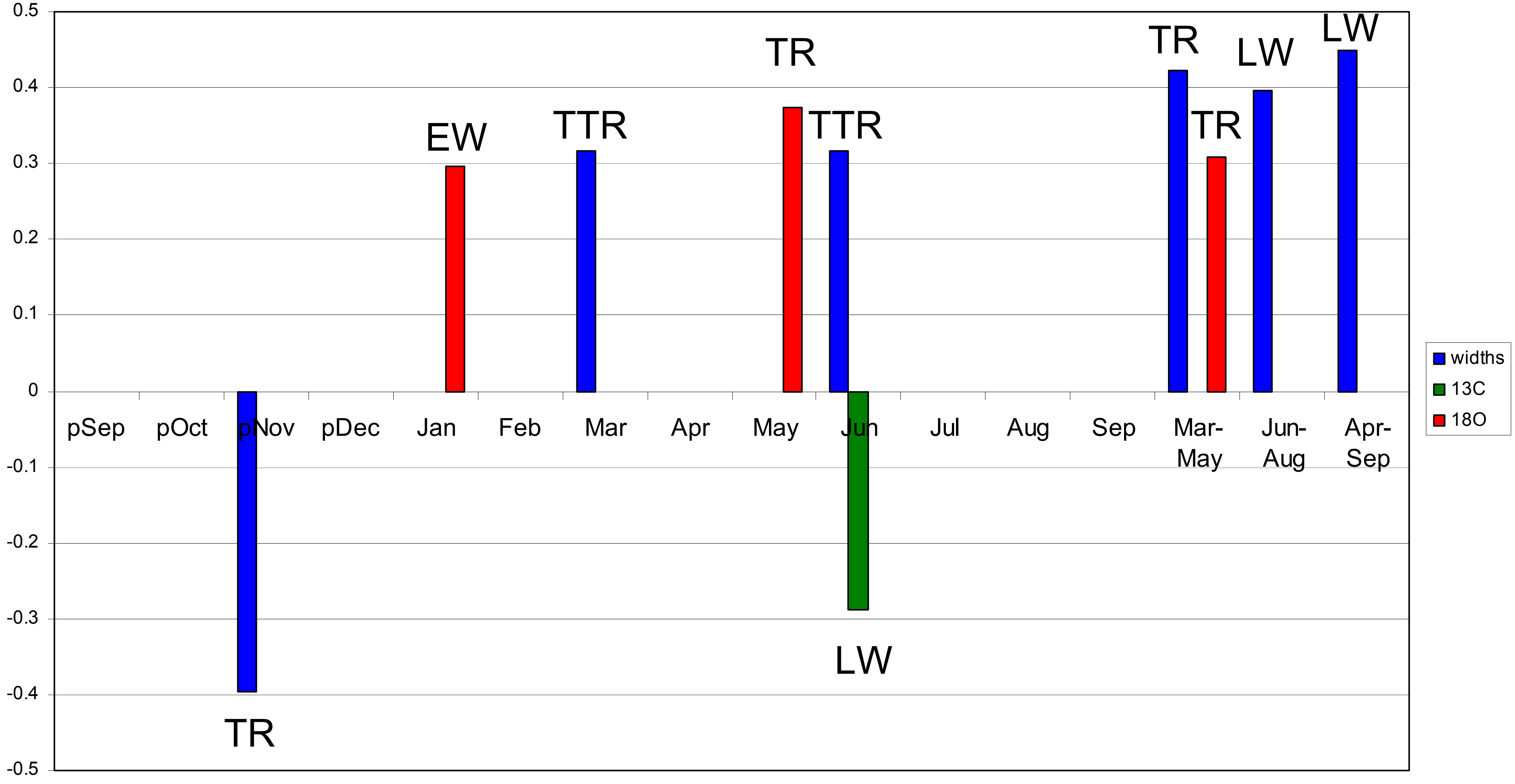


Prospects:

usability as climate proxies

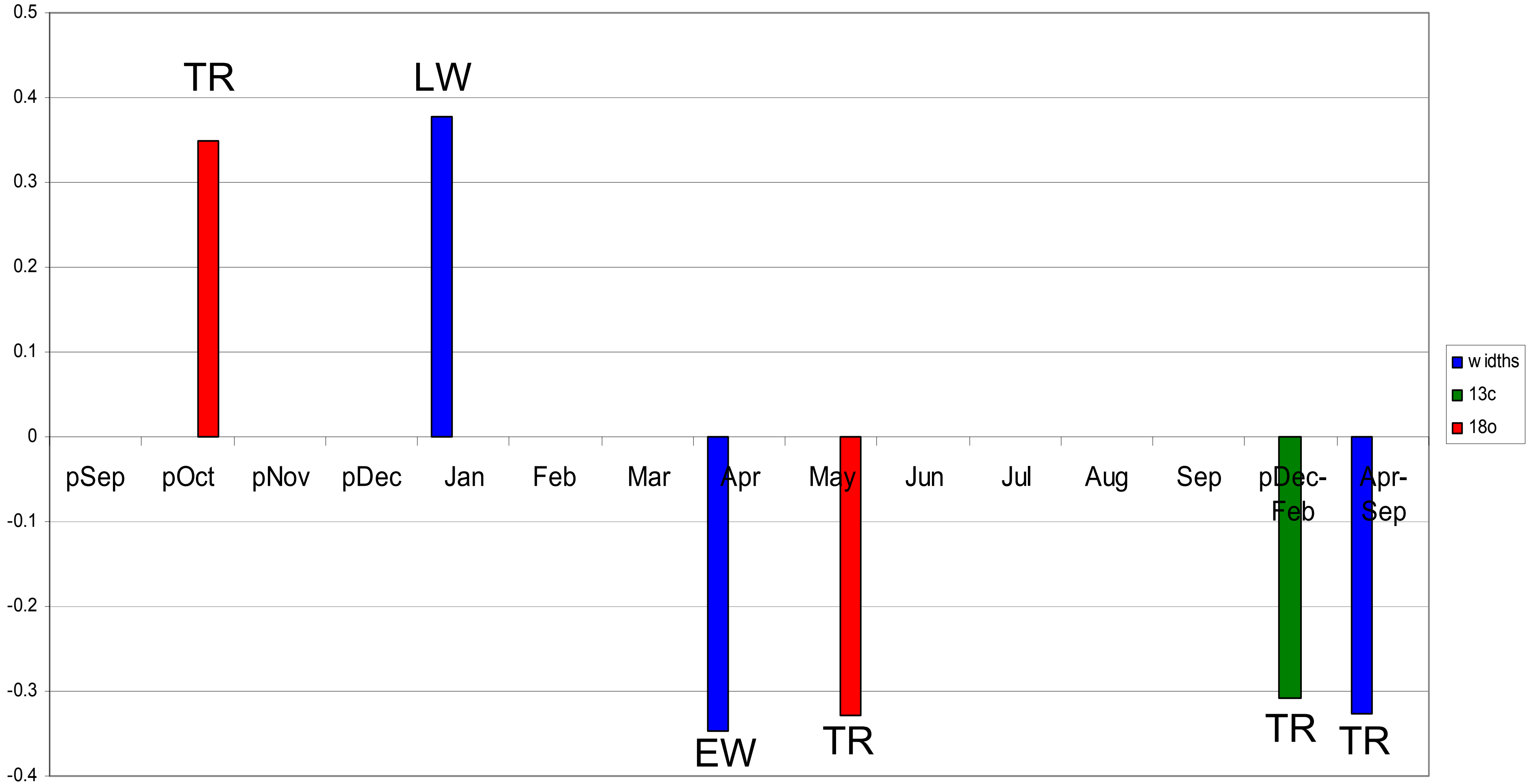
precipitation

simple correlations (r)



temperature

simple correlations (r)



Conclusion:

- all 3 methods:

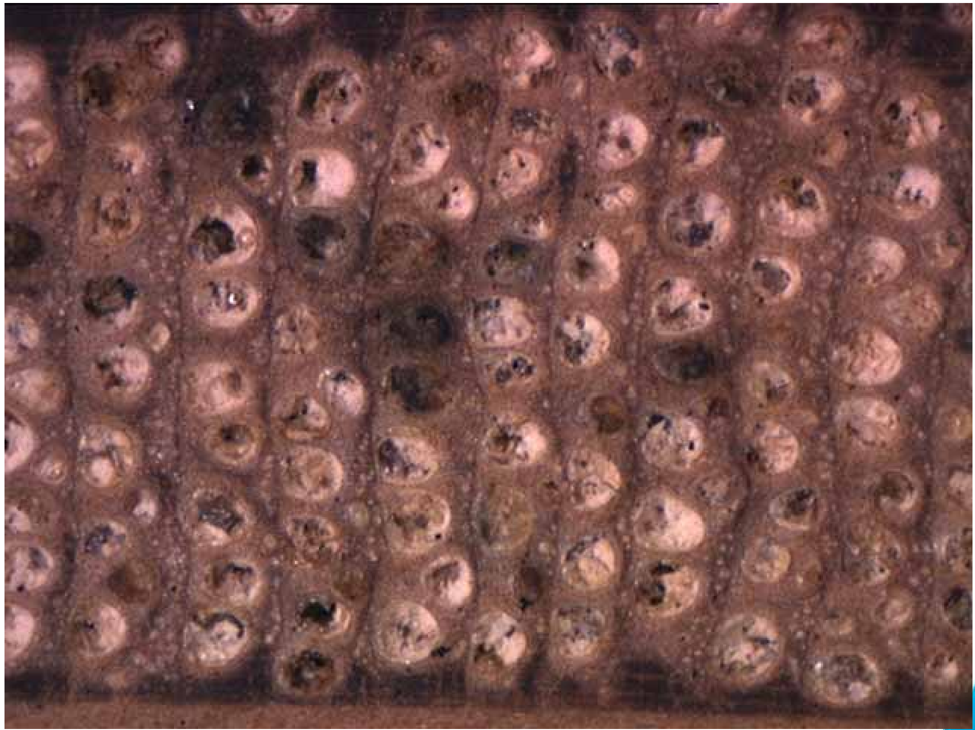
  LW best

  no cambial signal

  values **don't vary** strong with **height**

- climate-growth-relation: **widths>δ^{18}O>δ^{13}C**

thank you



Special thank goes to:

Dagmar Holztroeger

Melanie Schrimpf

Jussi Griessinger

and to the whole

ISONET-Team.

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radial variations

Gleichlaeufigkeit **t-values**