

DROUGHT-DRIVEN SEASONAL DYNAMICS OF TWO-AGE DIFFERENT EUROPEAN BEECH STANDS

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Introduction

- Wood formation growth (xylogenesis) and cell morphology (wood anatomical features) are directly influenced by climatic variations and local environmental stresses.
- Photosynthetic ability, growth rate, cambial activity production and wood formation kinetics decline with age.

Hypotheses

- H1:** Timing and duration of xylogenesis phenological phases (i.e. wood formation dynamics) changes with tree age.
- H2:** Cambial age of trees increases trees' sensitivity to climate change.

Objectives

- Monitoring xylogenesis dynamics in two age-different adult European beech (*Fagus sylvatica* L.) stands (50 and 135 years) during a dry year (2018).
- Compare the timing and duration of phenological phases and vessels' anatomical features between the two age classes.

Materials and methods

- **Study area:** Drahany highlands, South Moravian region, Czech Republic, ≈ 620 m. a.s.l., annual average T_{air} 7.5 ± 1.2 °C, annual PRCP 673 ± 144 (long-term data 1975-2012).



Fig. 1: Even-aged European beech stands, 50 years (left) and 135 years (right) in the Rájec-Němčice (Drahany highlands) research plot.

- **Sampling and analysis:** Two age classes (six trees per class), wood microcores, weekly sampling (April to November 2018), Trepbor tool; polarized microscope (phenology), ImageJ software (morphology).

Weather data

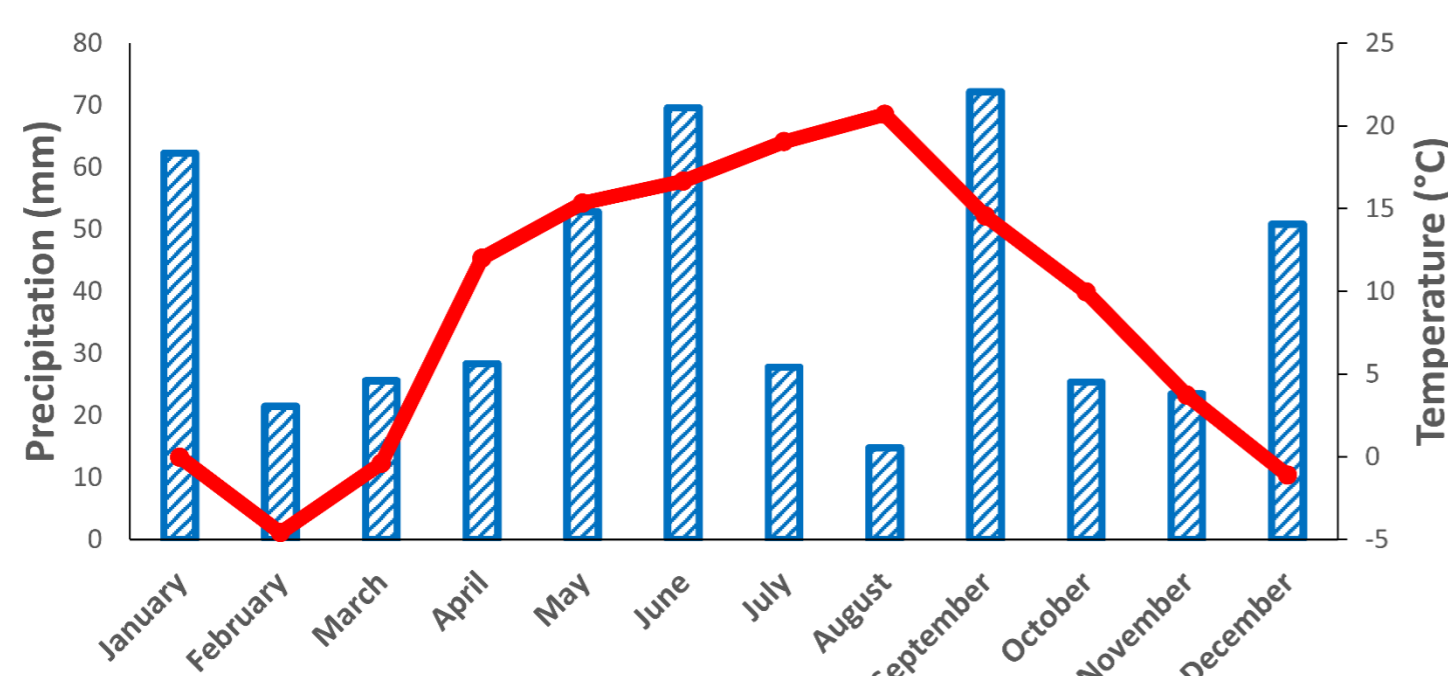


Fig. 2: Meteorological data of the research site during the year 2018 (monthly sum precipitation (columns) and monthly average air temperature (continuous line))

Results

Table 1: Occurrence of phenological phases of xylem growth ring formation in *Fagus sylvatica* expressed in DOY (DOY = day of the year) during 2018: beginning of cell enlargement (bE); beginning of wall thickening in vessels (bW); first mature vessels (bM); cessation of cell enlargement (cE) and cessation of secondary wall formation and lignification (cW); Tree-ring width (TRW).

	135 year-old	50 year-old
bE	123	123
bW	130	130
bM	158	158
cE	207	210
cW	231	242

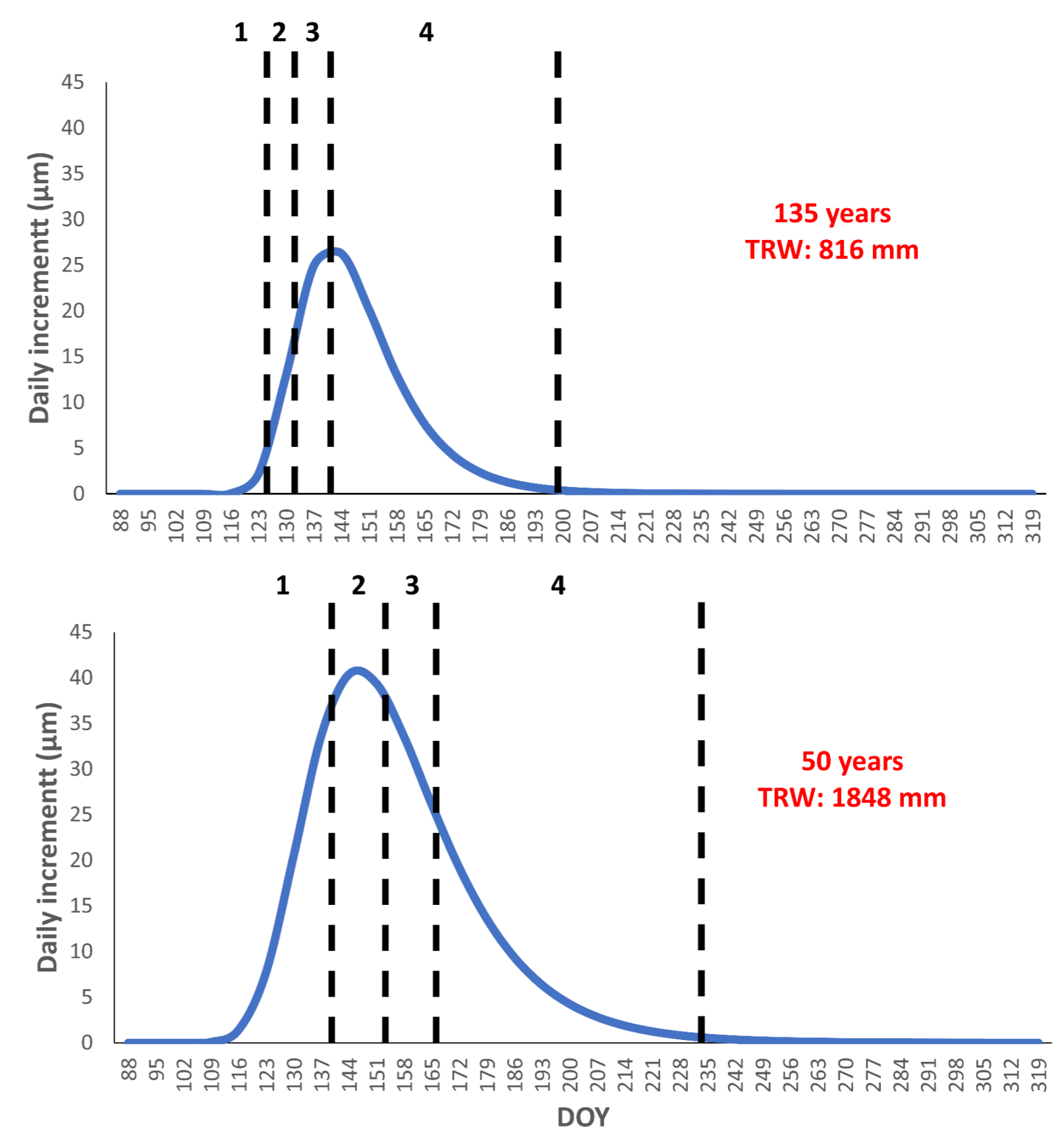


Fig. 3: Average first derivatives of Gompertz function (numbers represent TRW quarters) in each age-class European beech stand.

Conclusions

- Timing and duration of the cell enlargement phase were almost identical in both European beech stands.
- Variations were illustrated in tree-ring growth (quarters) formation according to the Gompertz function model.
- A notably higher maximum growth rate was also recorded in the younger age adult European beech stand trees (Gompertz function model).
- Vessels' anatomical features were distinctly varied in most cases between the first and last quarter of TRW in both stands (data not presented).
- Differences were observed in the vessels' anatomical features between the two age classes stands in each TRW quarter respectively, potentially indicating different sensitivity responses to local weather conditions (data in progress).

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