



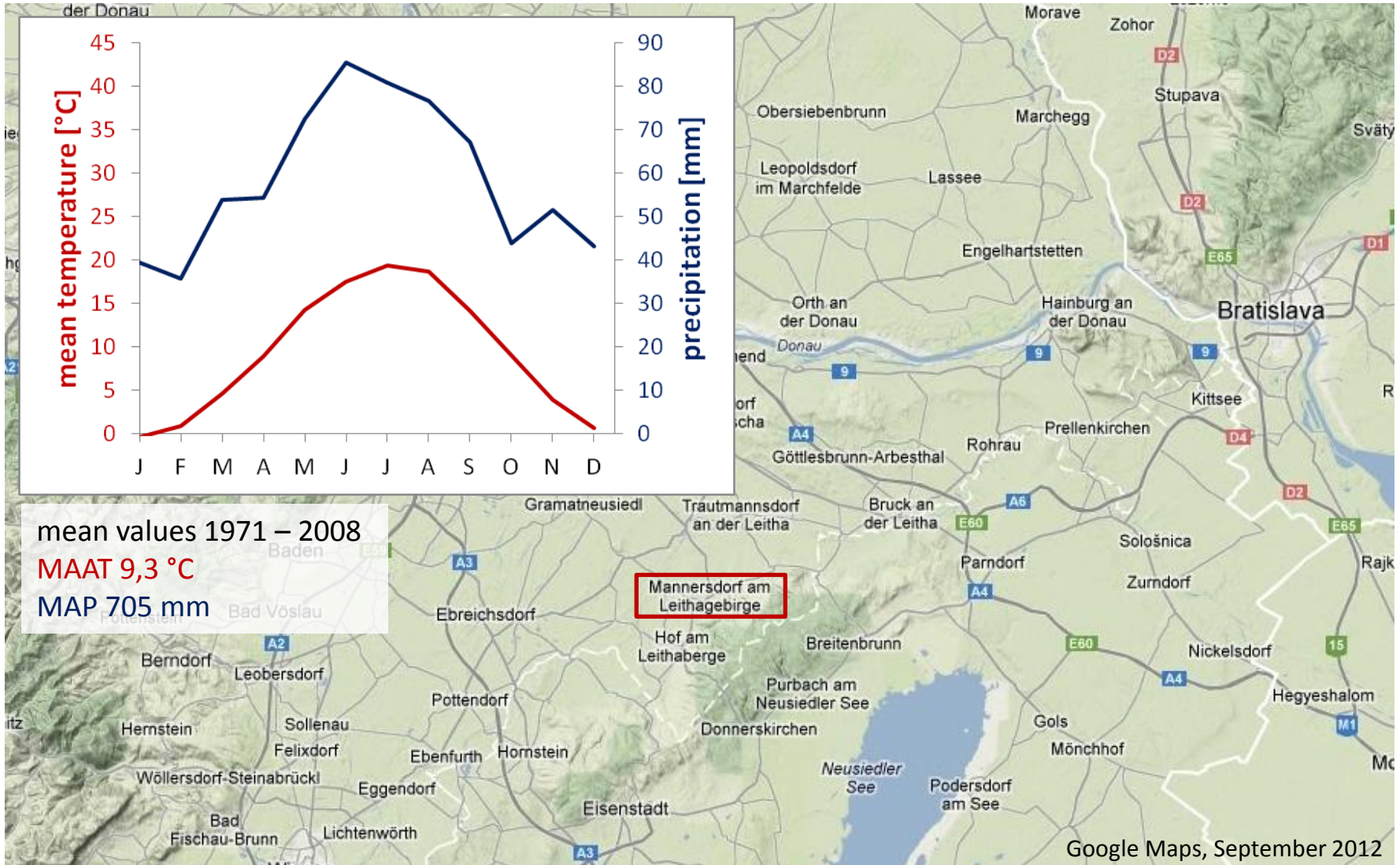
Influence of drought on ring width and wood density of hybrid larch (*Larix decidua x kaempferi*) in Eastern Austria

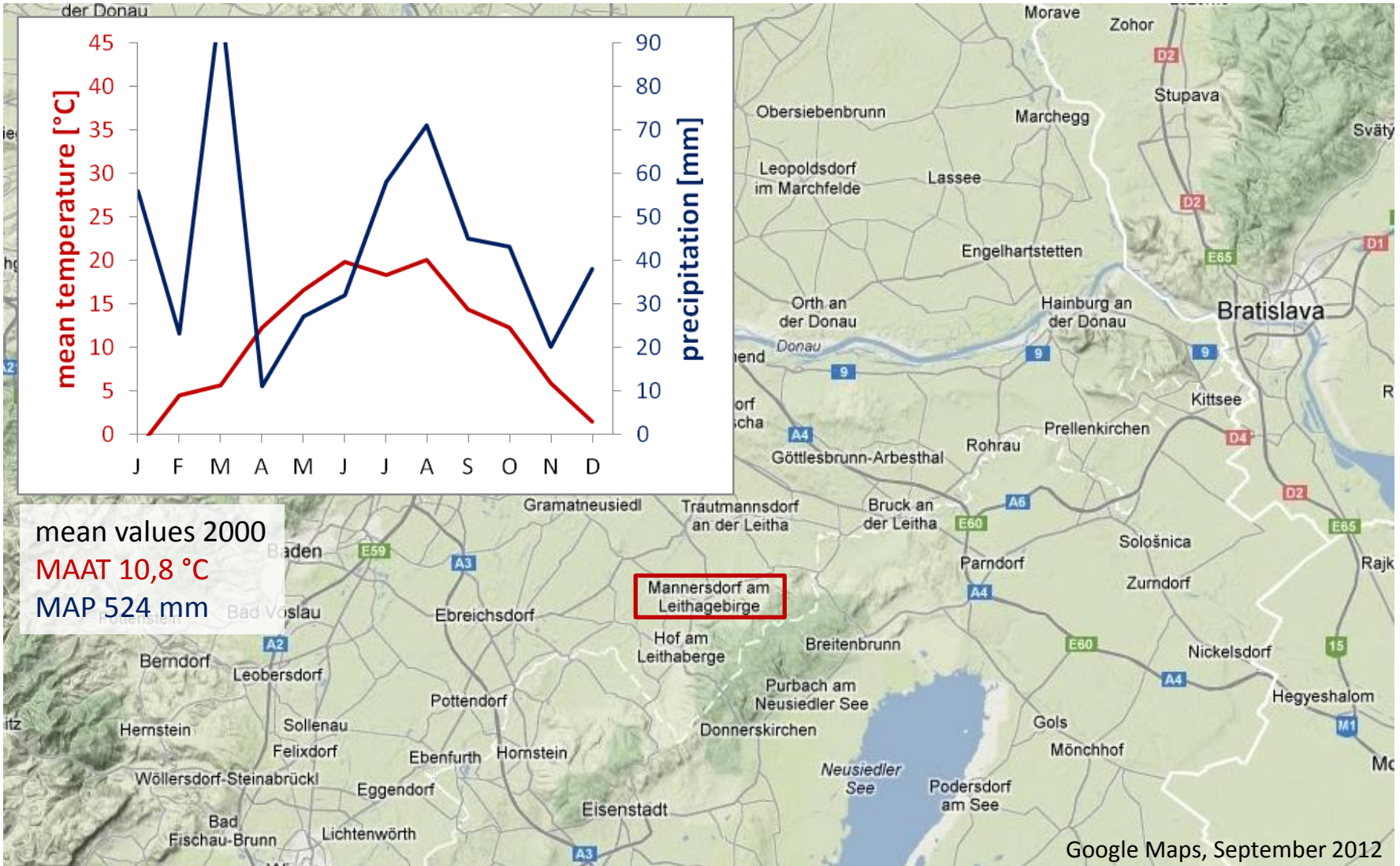
Sandra Karanitsch-Ackerl ¹ Johannes Tintner ¹ Silvio Schüller ² Michael Grabner ¹

Mannersdorf am Leithagebirge
16,624 °E, 47,950 °N, 360 m asl
natural oak-hornbeam site



Google Maps, September 2012





hybrid larch trial



stand at the age of 20 years
photo: WEISSENBACHER
from: GEBUREK and SCHÜLER 2011

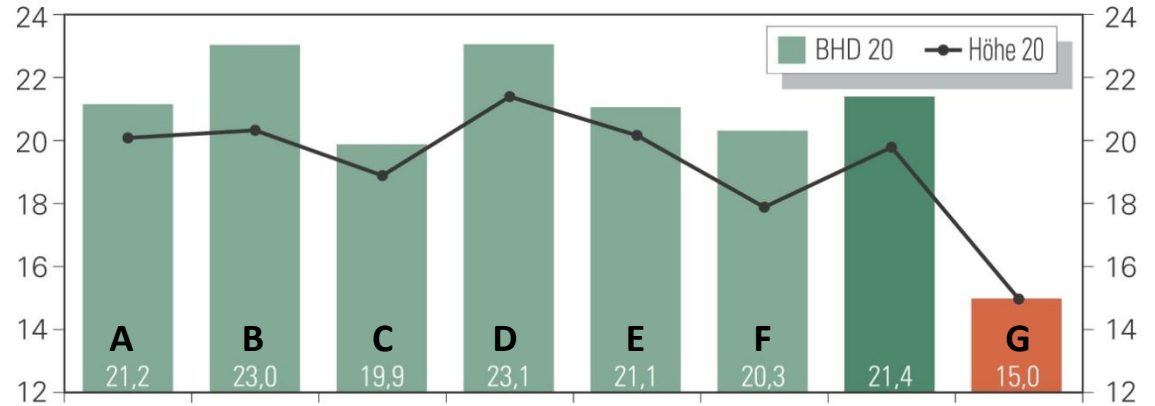
set up in spring 1991 by BFW
0,75 ha
gentle, north-facing slope
spacing 2 x 2,5 m
1.278 trees

	number	female parent	male parent	samples
A	3036	<i>L. decidua</i> Graupa 220	<i>L. kaempferi</i> Tharant 7	22
B	3039	<i>L. decidua</i> Graupa 220	<i>L. gmel. v. japon.</i> Sauen 74	23
C	3046	<i>L. decidua</i> Hohe Tatra 45	<i>L. kaempferi</i> Pillnitz 219	23
D	3404	<i>L. decidua</i> Reinerz 94	<i>L. kaempferi</i> Yatsugatake 1095	23
E	3828	<i>L. decidua</i> Altlengbach 44	<i>L. kaempferi</i> Kumashiroyama 1041	22
F	3858	<i>L. decidua</i> Reinerz 94	<i>L. kaempferi</i> Okkunikko 1049	23
G	Austrian standard <i>L. decidua</i>			23

sampling on March 22nd, 2011
159 trees from 22 plots (2 – 13 trees per plot)

hybrid larch trial – previous results

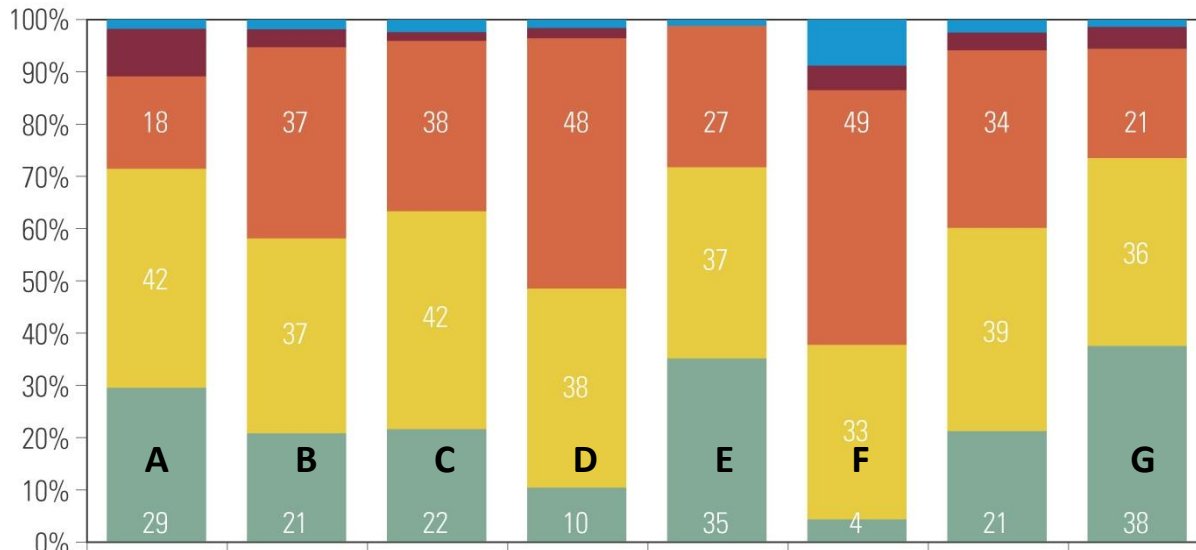
GEBUREK and SCHÜLER, 2011



- straight stem
- slightly crooked
- strongly crooked

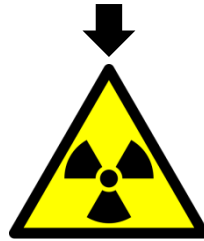
- snow damage
- forking

BHD 20: diameter at breast height at the age of 20 years [cm]
 Höhe 20: tree height at the age of 20 years [m]



measuring procedure

159 samples A B C D E F G



X-ray densitometry

measured/calculated variables

annual ring width [μm]

latewood proportion [%]

annual minimum density [kg/m^3]

annual mean density [kg/m^3]

annual maximum density [kg/m^3]

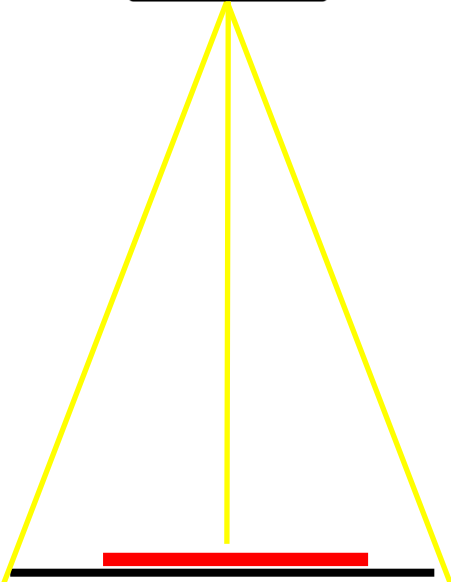
proportion of samples with false rings [%]

analyzed period: 1992 – 2010

X-ray densitometry



x-ray source



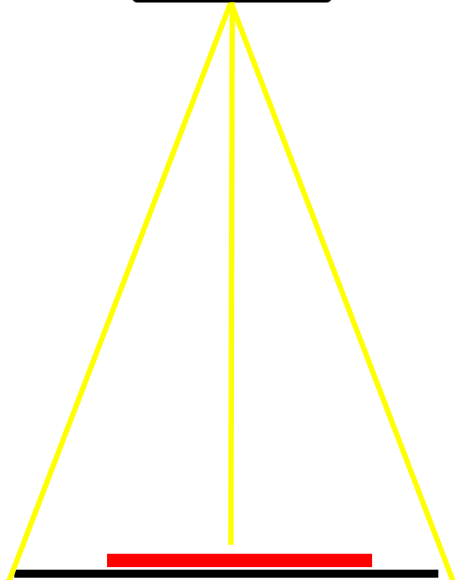
wood sample
x-ray film



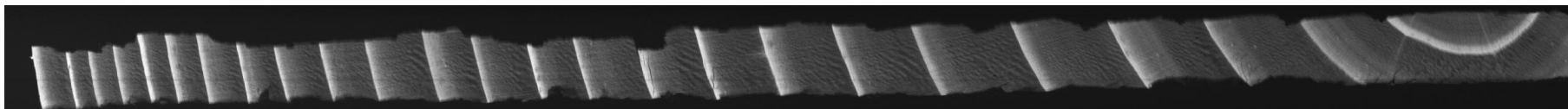
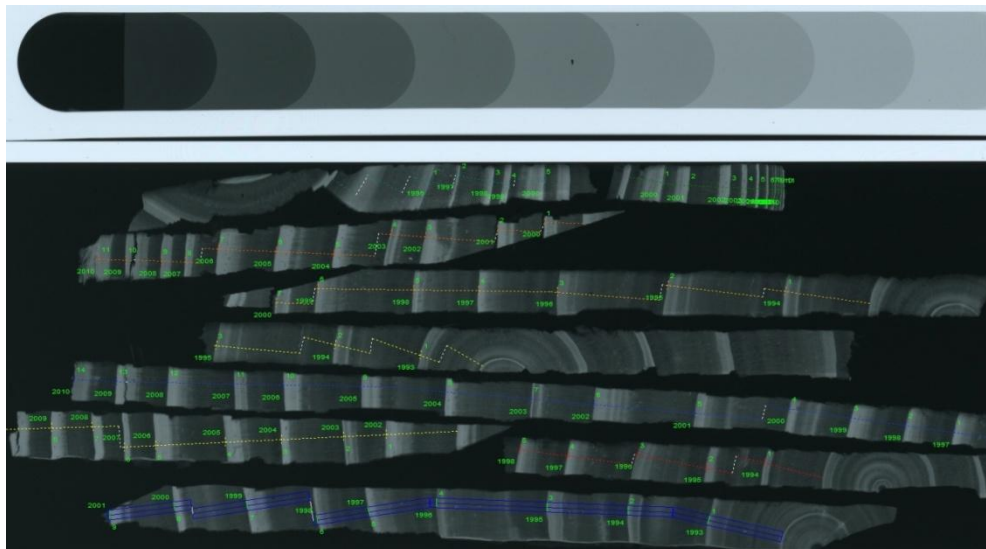
X-ray densitometry



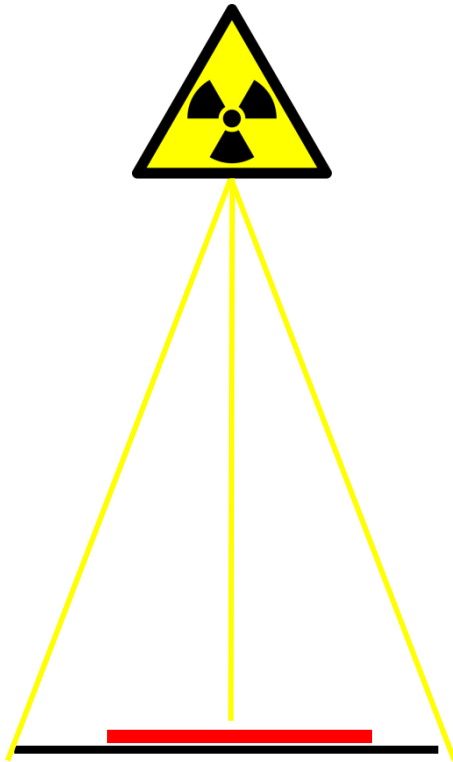
x-ray source



wood sample
x-ray film

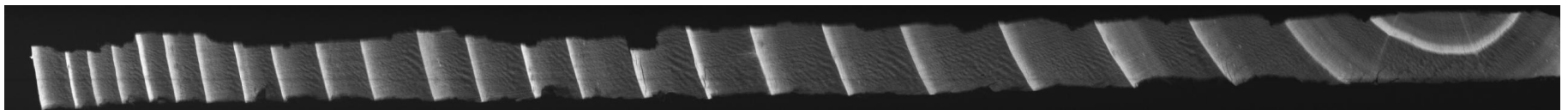
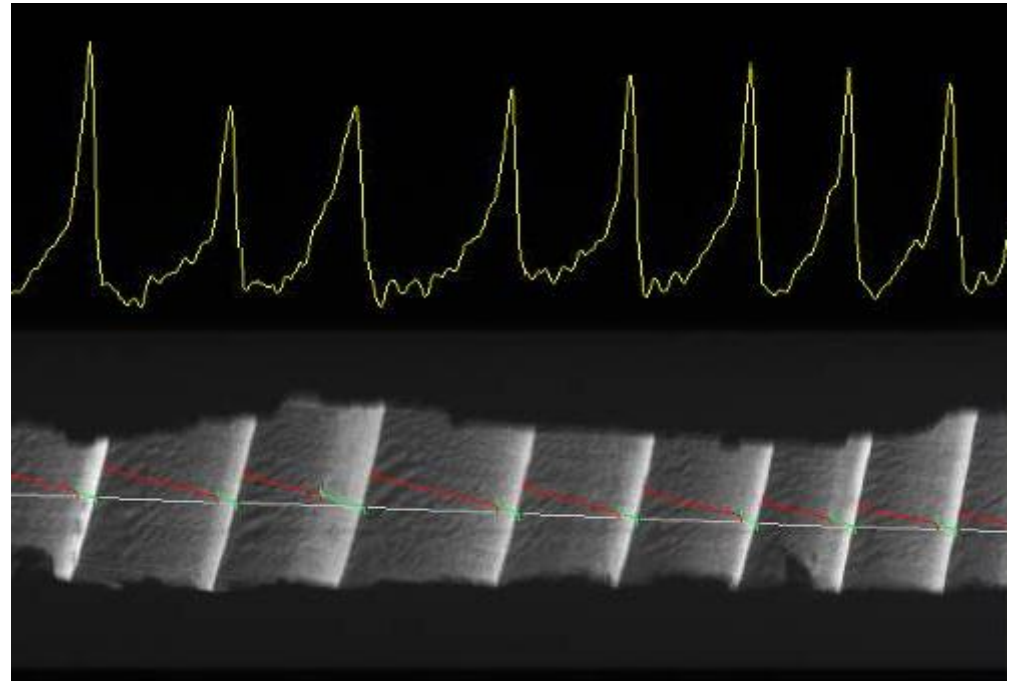


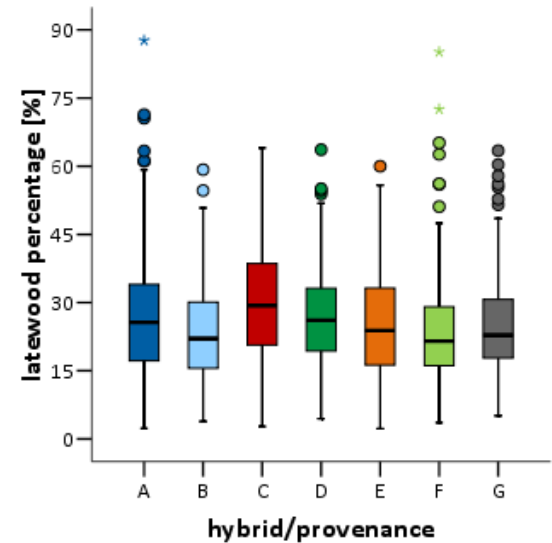
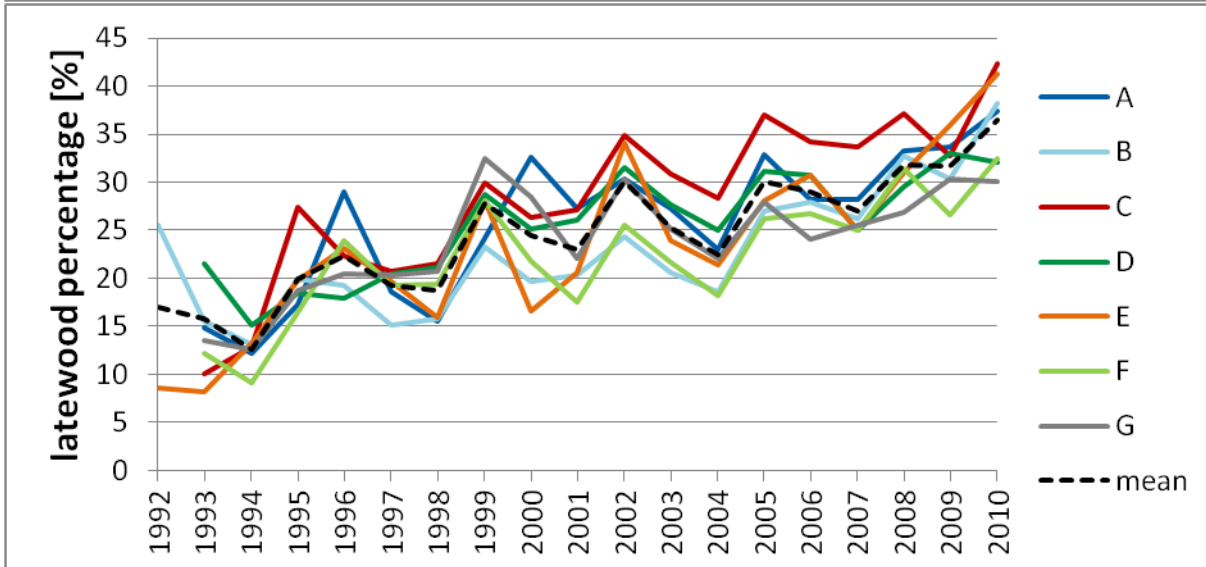
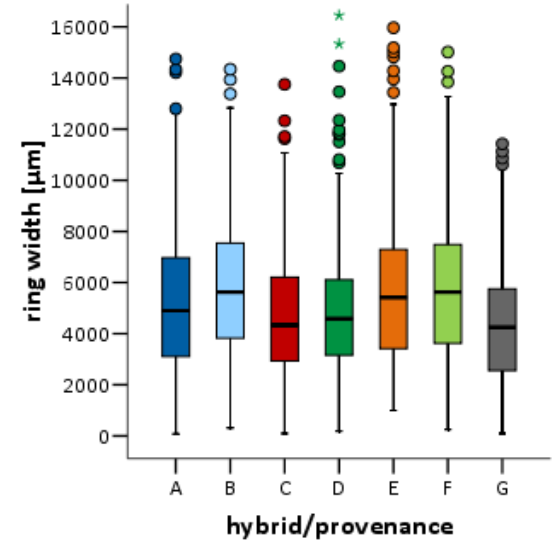
X-ray densitometry



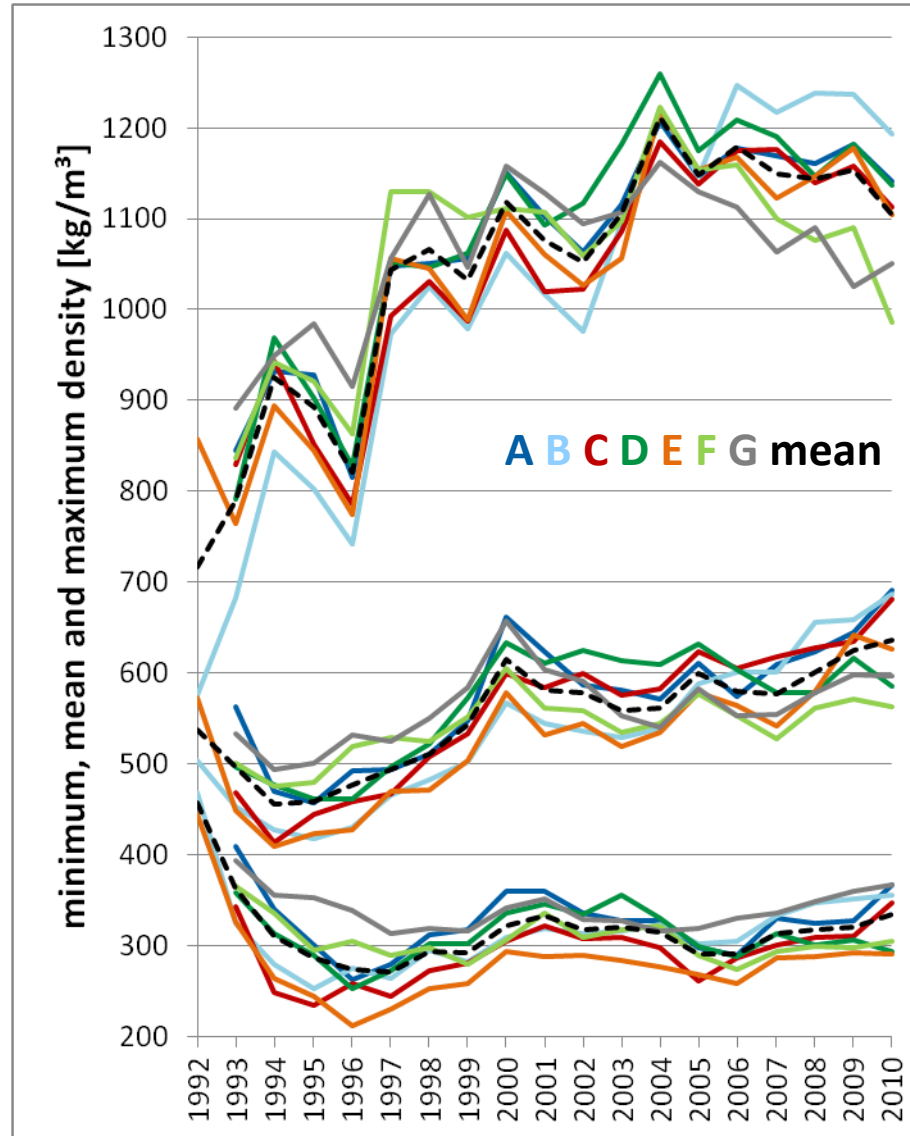
x-ray source

wood sample
x-ray film

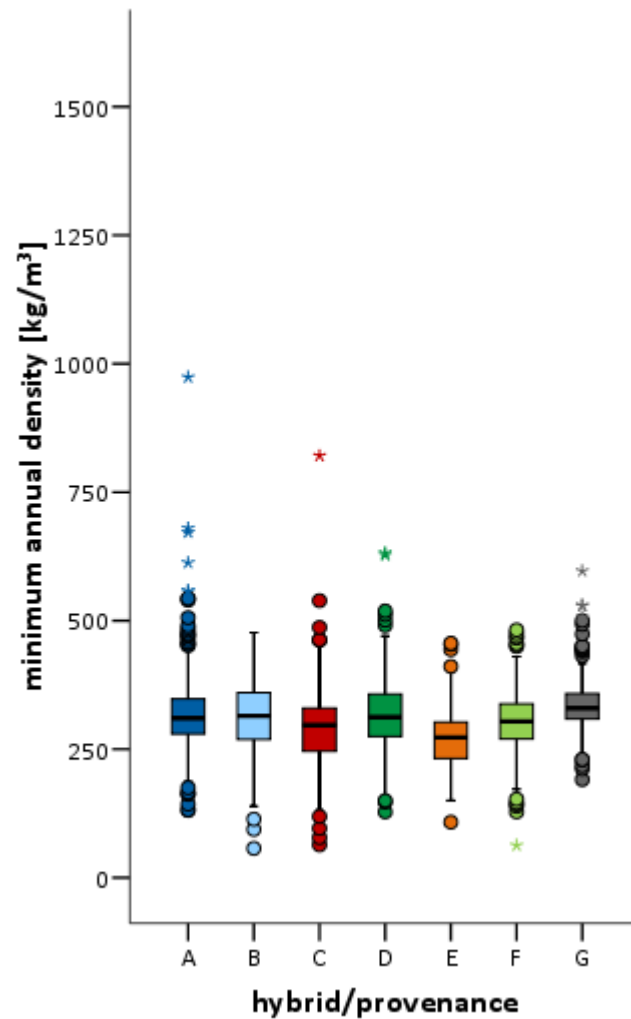
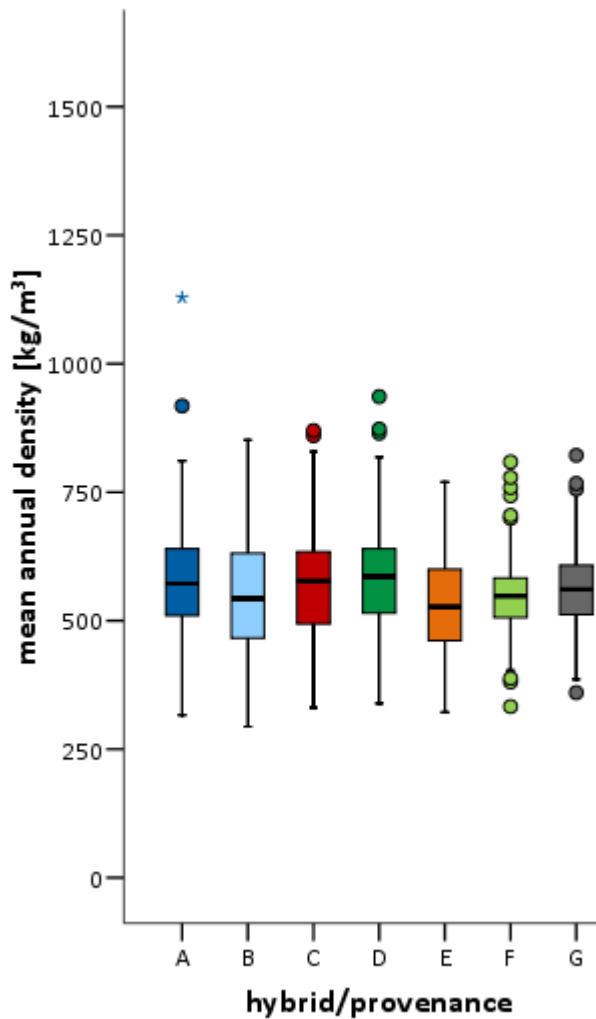
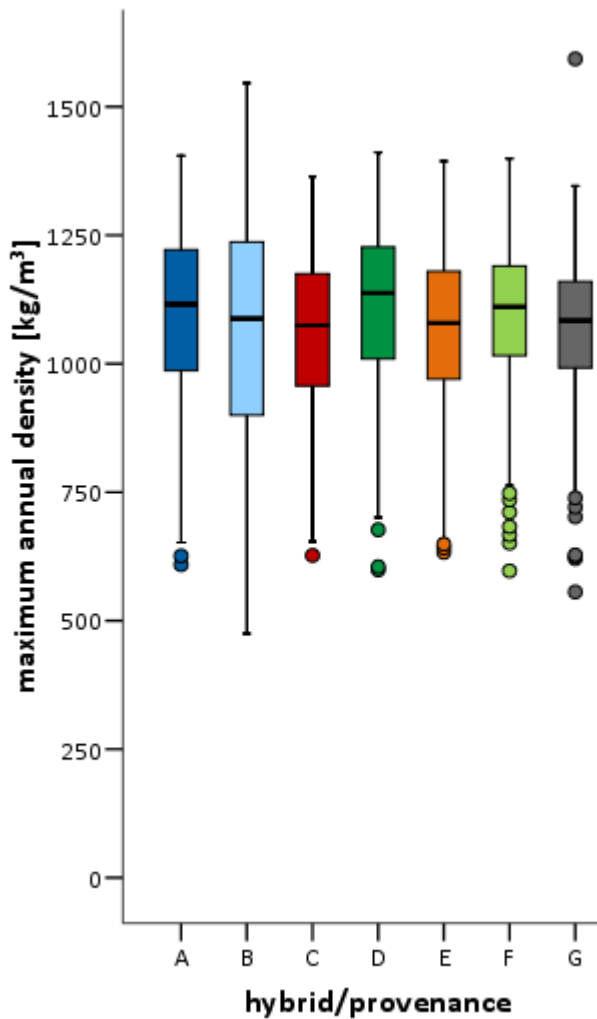




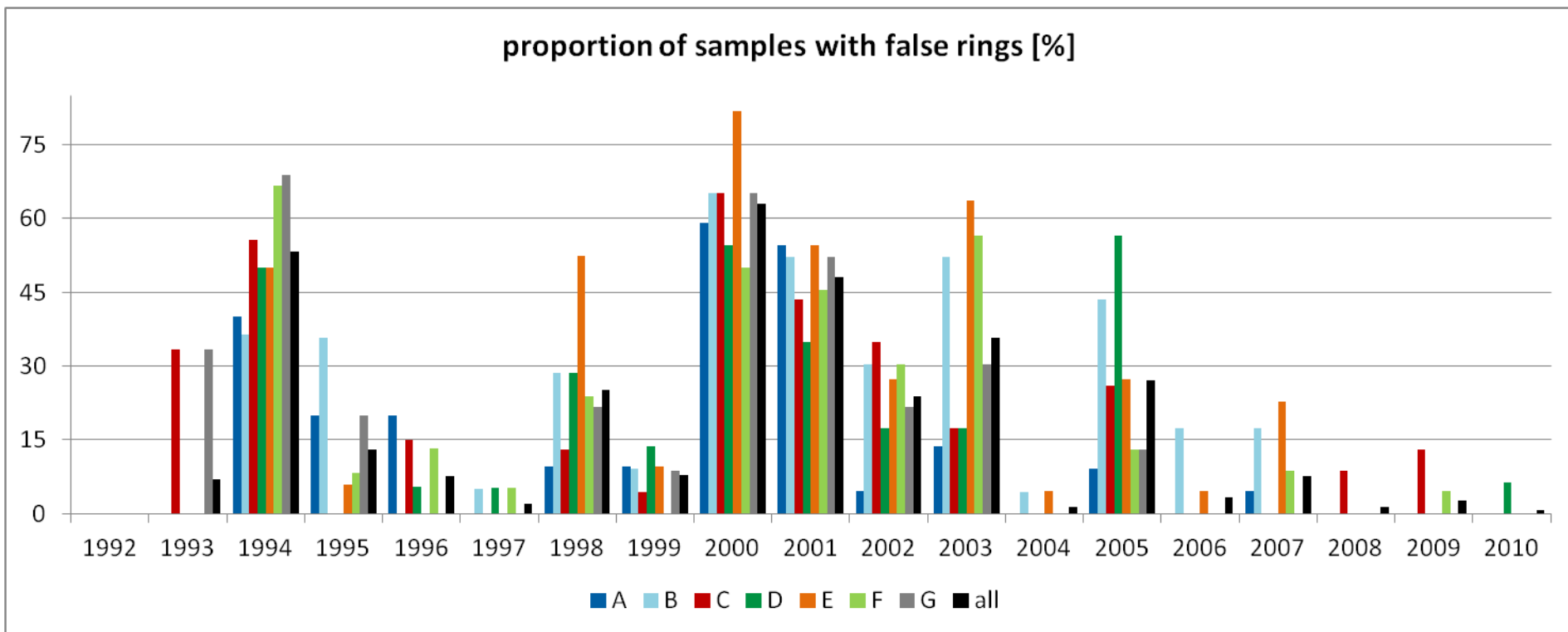
results – density



results – density



results – false rings



standardization – detrending

measured/calculated variables

annual ring width [μm]
latewood proportion [%]
annual minimum density [kg/m^3]
annual mean density [kg/m^3]
annual maximum density [kg/m^3]
proportion of samples with false rings [%]



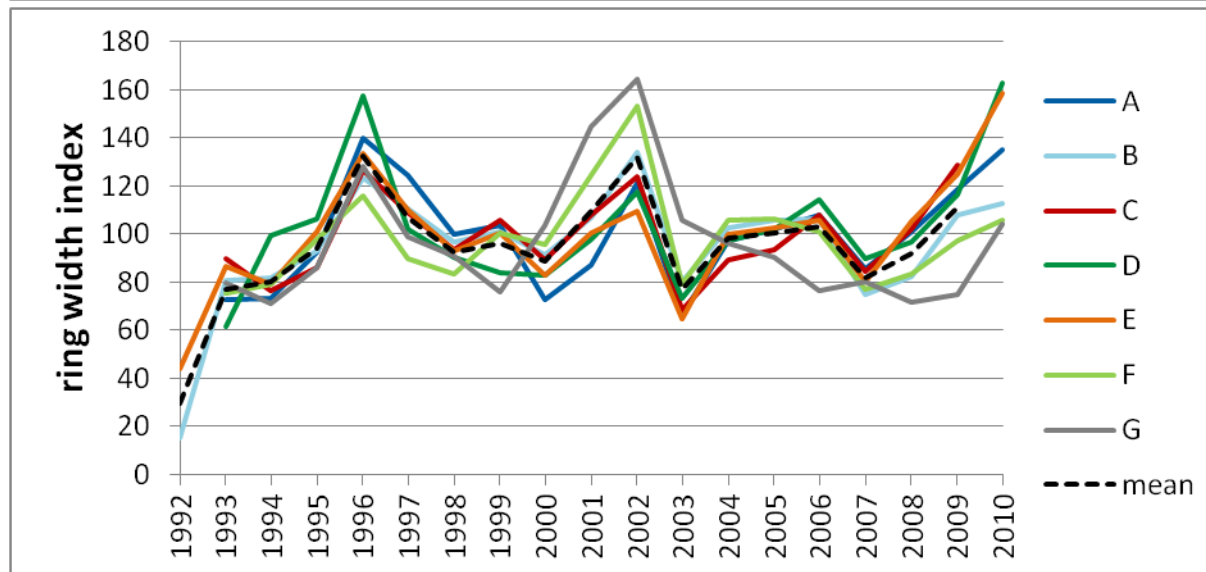
standardization = removal of age trend
30-year cubic smoothing spline
average for every hybrid



standardized means

annual ring width
latewood percentage
annual minimum density
annual mean density
annual maximum density
proportion of samples with false rings [%]

standardization – detrending



climatic influence

standardized means
annual ring width
latewood percentage
annual minimum density
annual mean density
annual maximum density
proportion of samples with false rings [%]

monthly climate data
precipitation sum [mm]
mean temperature [°C]

↓
SPEARMAN rank correlations
 $\alpha = 0,05$
1992 – 2008

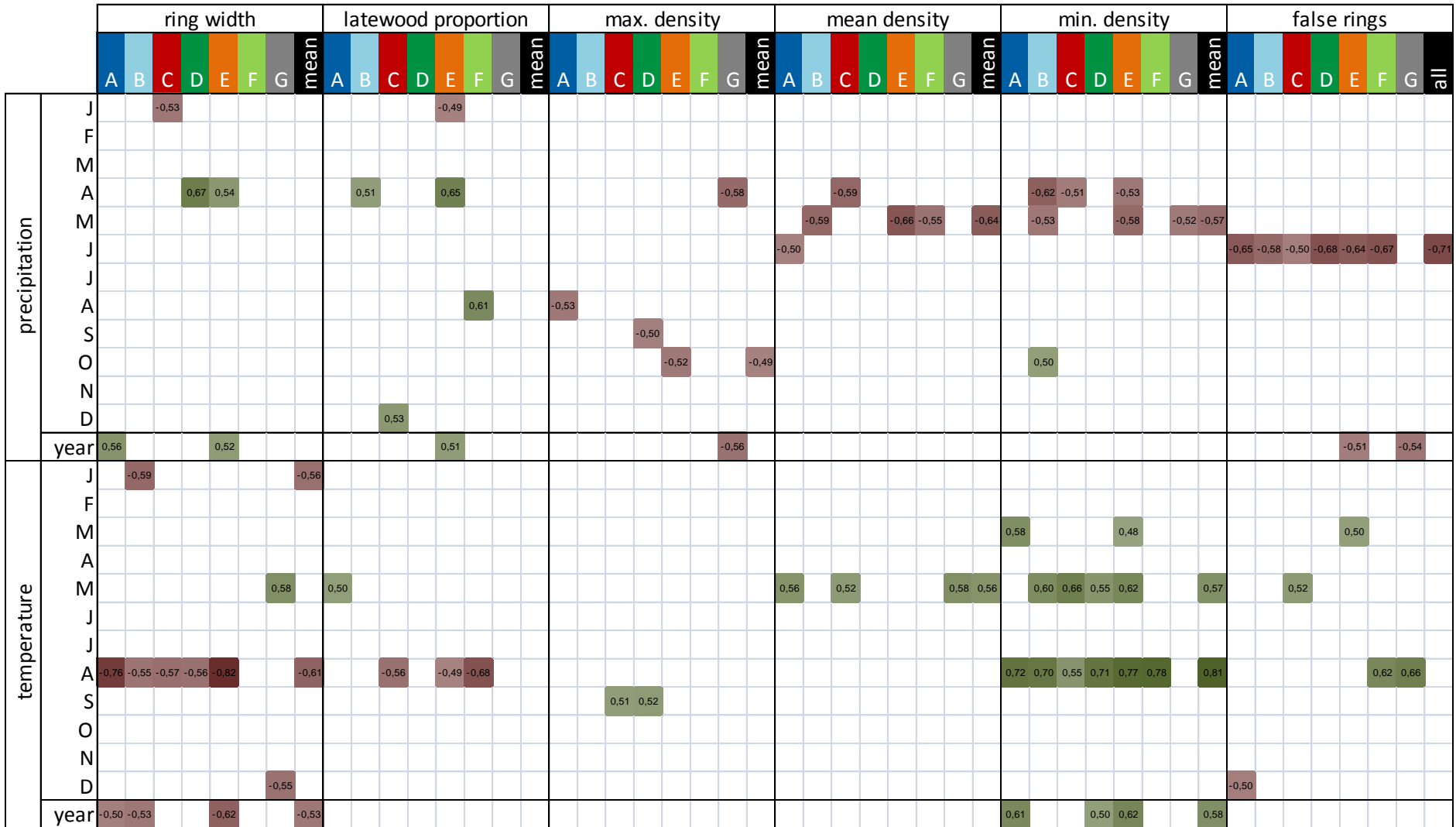
seasonal climate data
for subsequent months
precipitation sum [mm]
mean temperature [°C]



climatic influence



significant SPEARMAN rank correlation coefficients 1992 – 2008, R = -0,8 -0,5 0 0,5 0,8

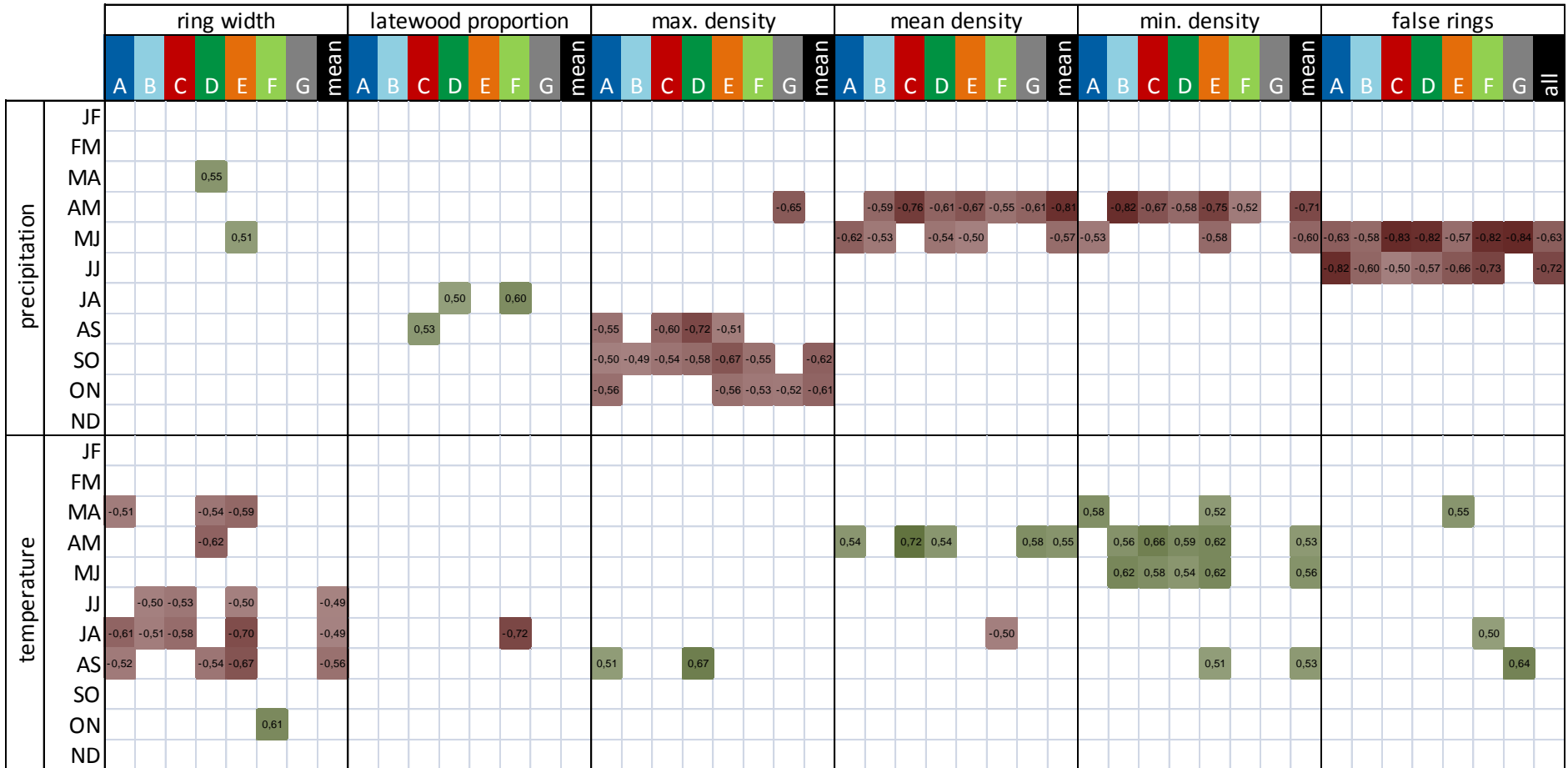




climatic influence



significant SPEARMAN rank correlation coefficients 1992 – 2008, R = -0,8 -0,5 0 0,5 0,8

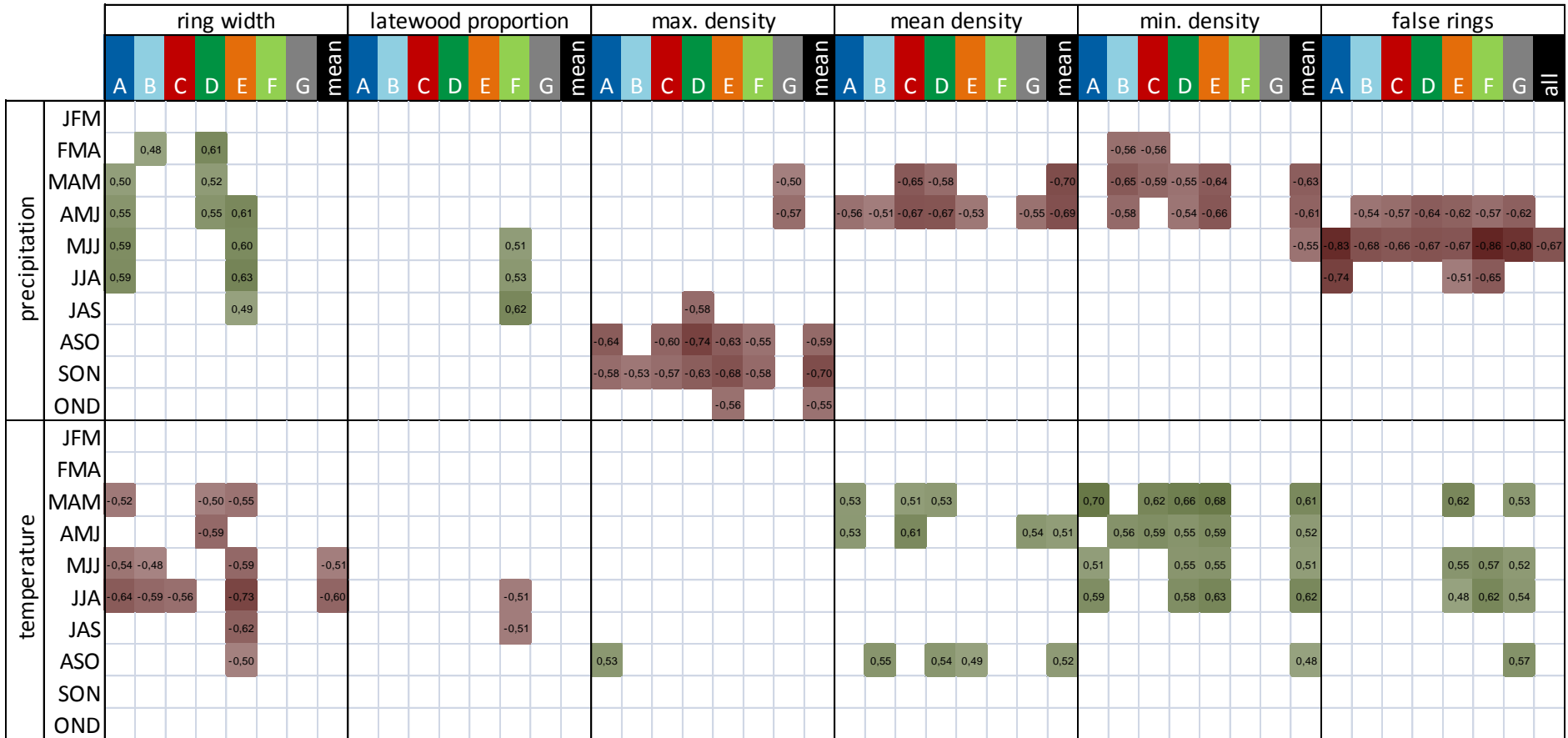




climatic influence



significant SPEARMAN rank correlation coefficients 1992 – 2008, R = -0,8 -0,5 0 0,5 0,8



forestry

- hybrids outperform *L. decidua* in BHD, height and increment, but not in stemform
- *L. decidua* is better in stem form and wood quality

climate sensitivity

- water availability is the overall limiting factor
- *L. decidua* presumably more drought resistant (KRAL 1960s)
- same patterns, but somewhat different timing between hybrids
- false rings highly correlated with June and July precipitation (neg.)

false rings

- a sign of high hydraulic plasticity – high drought resistance?
- a sign of drought stress – low drought resistance?



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Thank you for your attention!

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