NATIONAL DEVELOPMENT PLAN 2020
EUROPEAN UNION
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INVESTING IN YOUR FUTURE

«Decision support tool for increased forest productivity via efficient climate-adjusted transfer of genetic gain» (No 1.1.1.1/19/A/111)

SILAVA

Heritable weather-growth relationships: case study of Scots pine provenances

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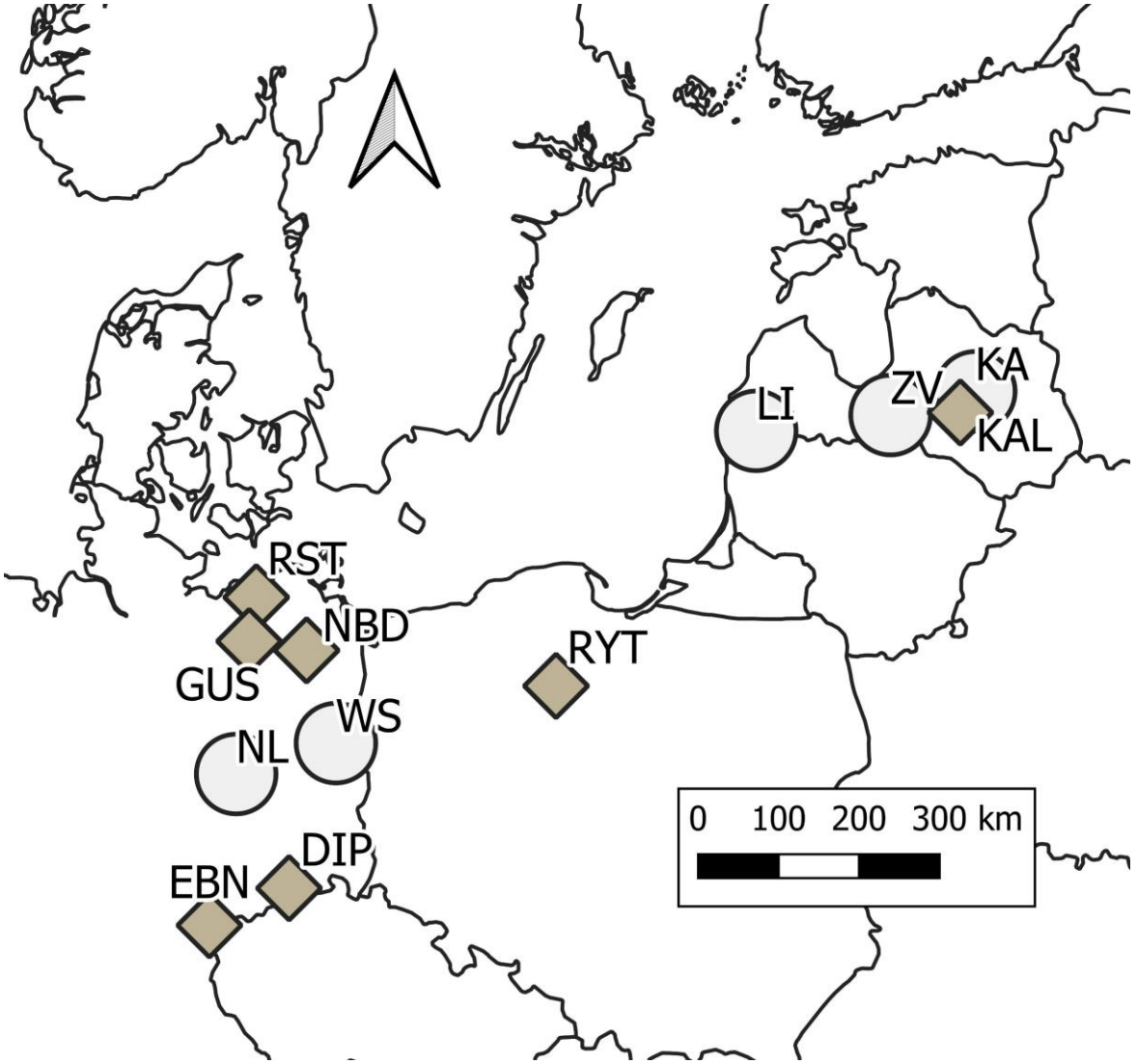
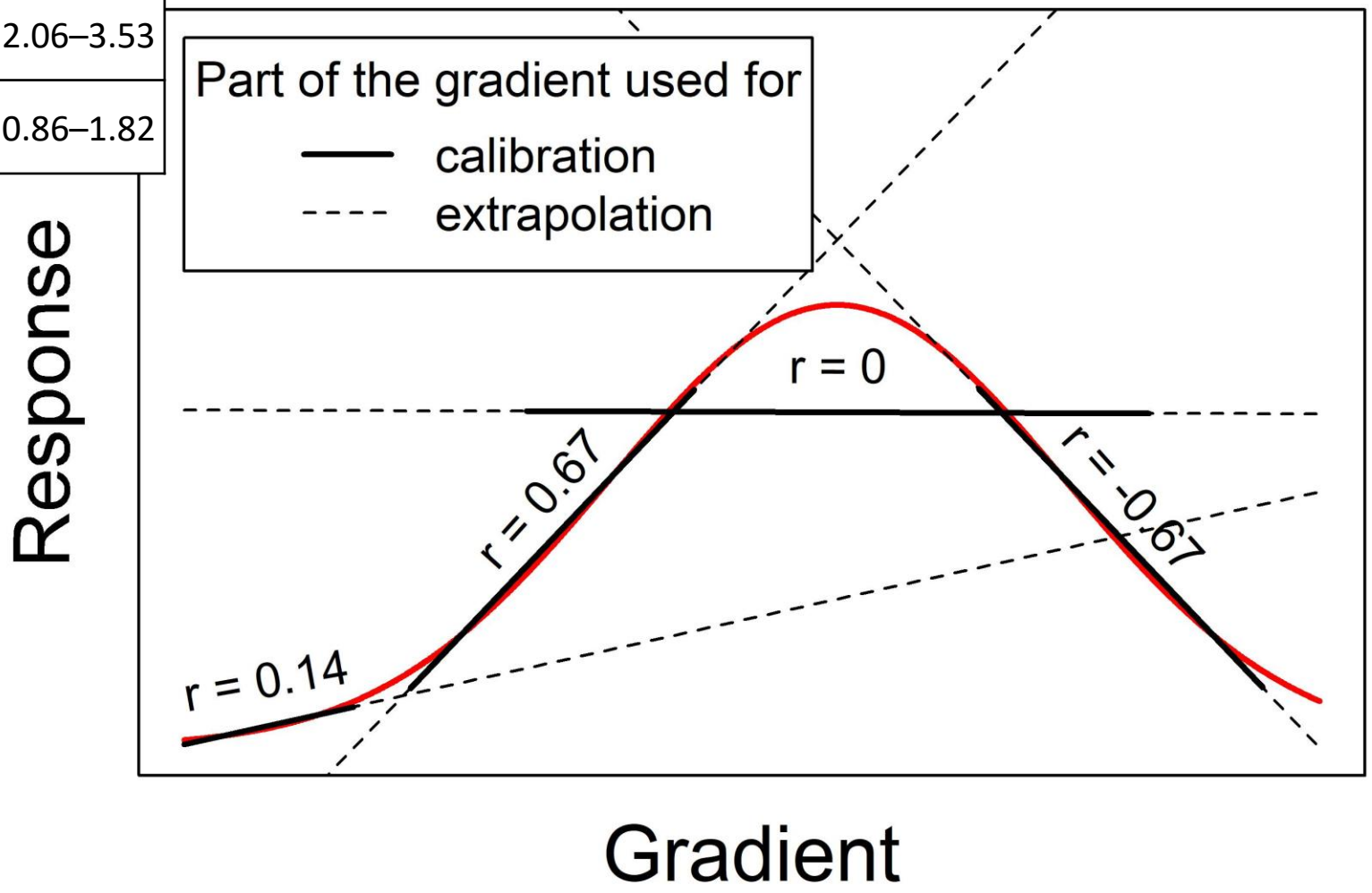
Genetic control over sensitivity?

- Scots pine
- Seven provenances with differing performance
- Five trials
- Climatic gradient
- Tree-ring width
- Detrending
- GAMM



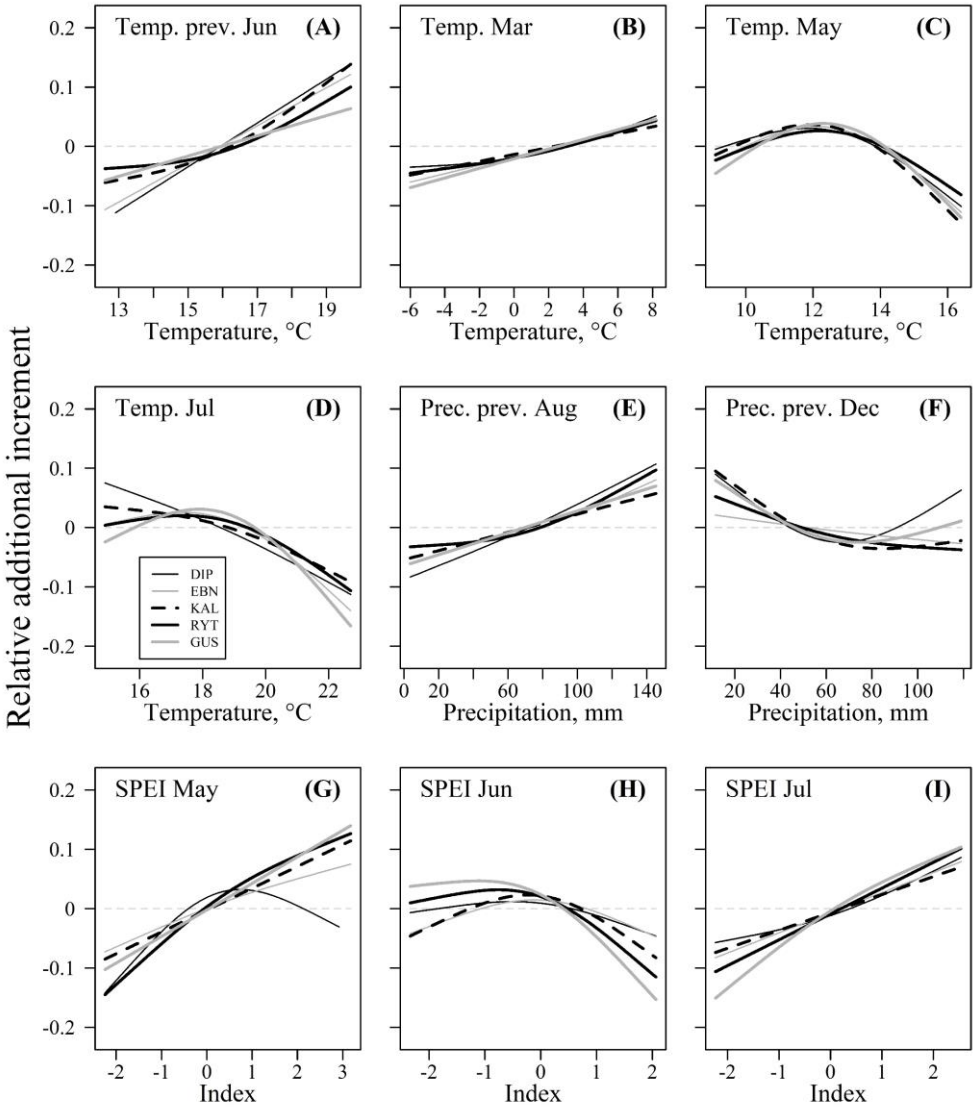
Ecological responses: linearity, stationarity?

Number of cross-dated trees	9–17
Mean series length, years	33-35
Mean tree-ring width, mm	2.06–3.53
St. dev. tree-ring width, mm	0.86–1.82



Pine provenances: nonlinear

- Complex influences
- Carryover effects
- Provenance specific
- Productivity related sensitivity



Pine provenances: sensitivity and genetic control

- Local linear relationships (correlations)
- Quantitative genetics
- Heritable sensitivity

	H^2	PCV
Temperature previous July	0.27 ± 0.17	0.60
Temperature previous September	0.25 ± 0.16	0.45
Temperature January	0.21 ± 0.11	0.65
Temperature June	0.29 ± 0.17	0.44
Precipitation previous June	0.32 ± 0.15	0.24
Precipitation March	0.23 ± 0.15	0.56
Precipitation July	0.26 ± 0.14	0.18
SPEI previous October	0.15 ± 0.10	0.58
SPEI previous November	0.25 ± 0.17	0.47
SPEI June	0.24 ± 0.18	0.54
SPEI July	0.17 ± 0.11	0.44
SPEI August	0.25 ± 0.17	0.50
SPEI September	0.27 ± 0.16	0.62

$$y_{ijk} = \mu + t_i + b_{(j)i} + (p_k) + (p_k : t_i) + \left(p_k : b_{j(i)}\right) + \varepsilon$$

$$H^2 = \frac{\sigma_p^2}{\sigma_p^2 + \sigma_{p:t}^2 + \sigma_{p:b}^2 + \sigma_\varepsilon^2} \qquad PCV = \frac{\sqrt{\sigma_p^2}}{\bar{y}}$$

Conclusions

- The differences in sensitivity of radial growth of the studied provenances highlighted genetic specialization of metapopulations to local climates in the mid-part of species distribution.
- The strength of genetic control over growth sensitivity, however, differed throughout the season, indicating varying adaptive significance of weather conditions.
- The highest heritability was estimated for the sensitivity of radial growth to weather conditions affecting the summer moisture regime, as well as to conditions in winter and late summer of the preceding year. Accordingly, growth sensitivity appears to be a promising and complementary trait for selection of the most suitable genotypes

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Thank You!

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