

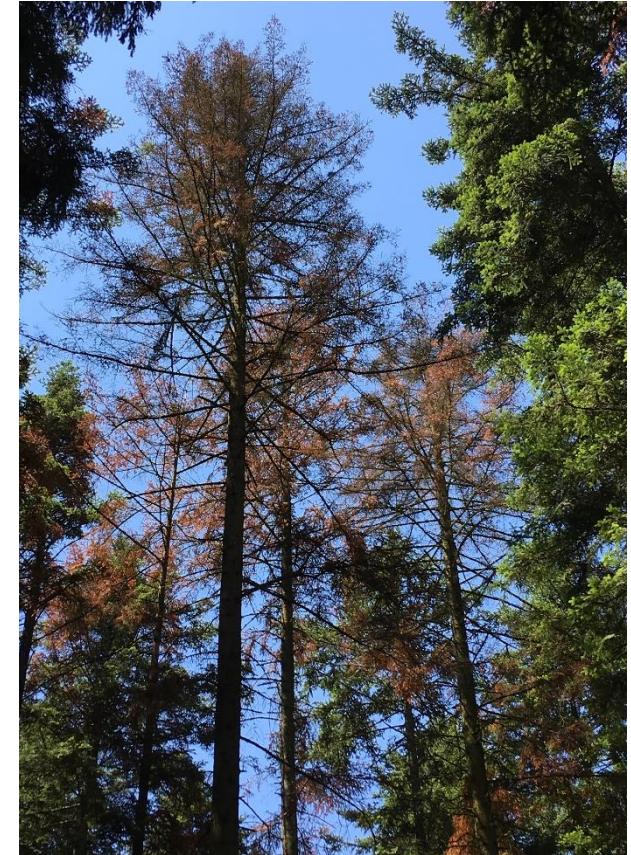
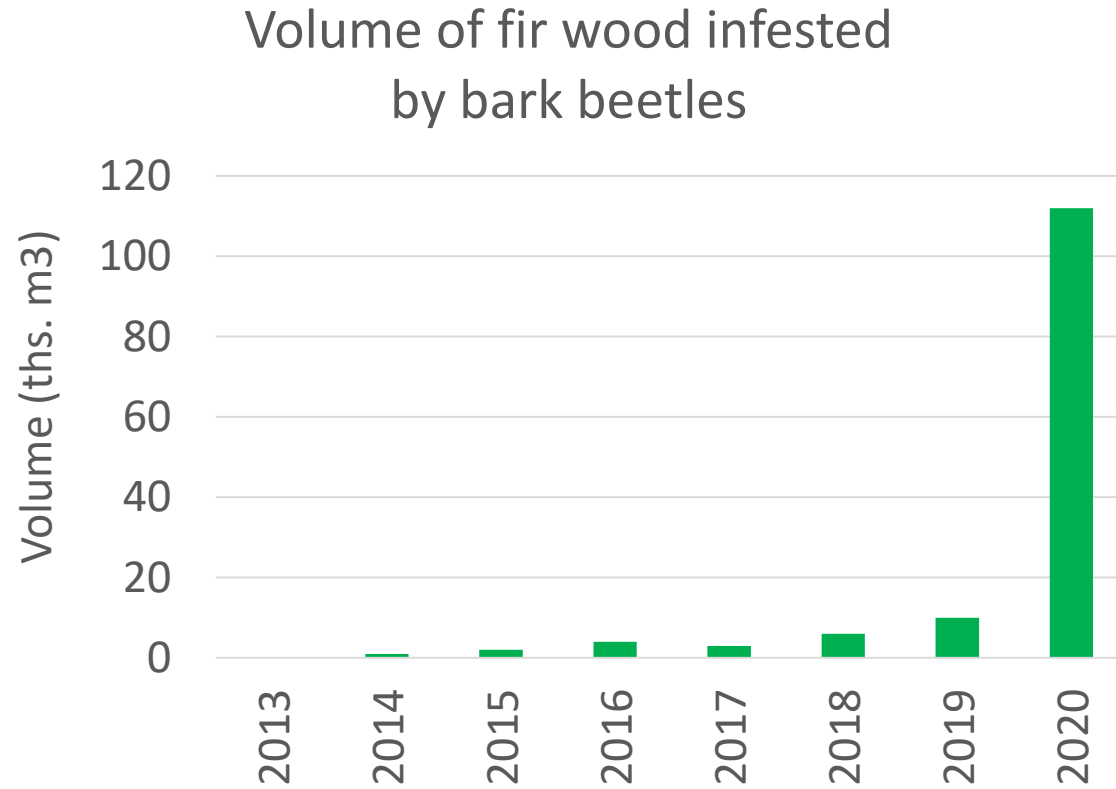
# Tree-ring analysis shows a remarkable regenerative capacity and drought resistance of Silver fir

Monika Vejpustková, Tomáš Čihák



Bilateral workshop of forest research institutions  
from the Czech Republic and Saxony  
Deštné v Orlických horách, Czech Republic  
21. 9. – 22. 9. 2022

# Background



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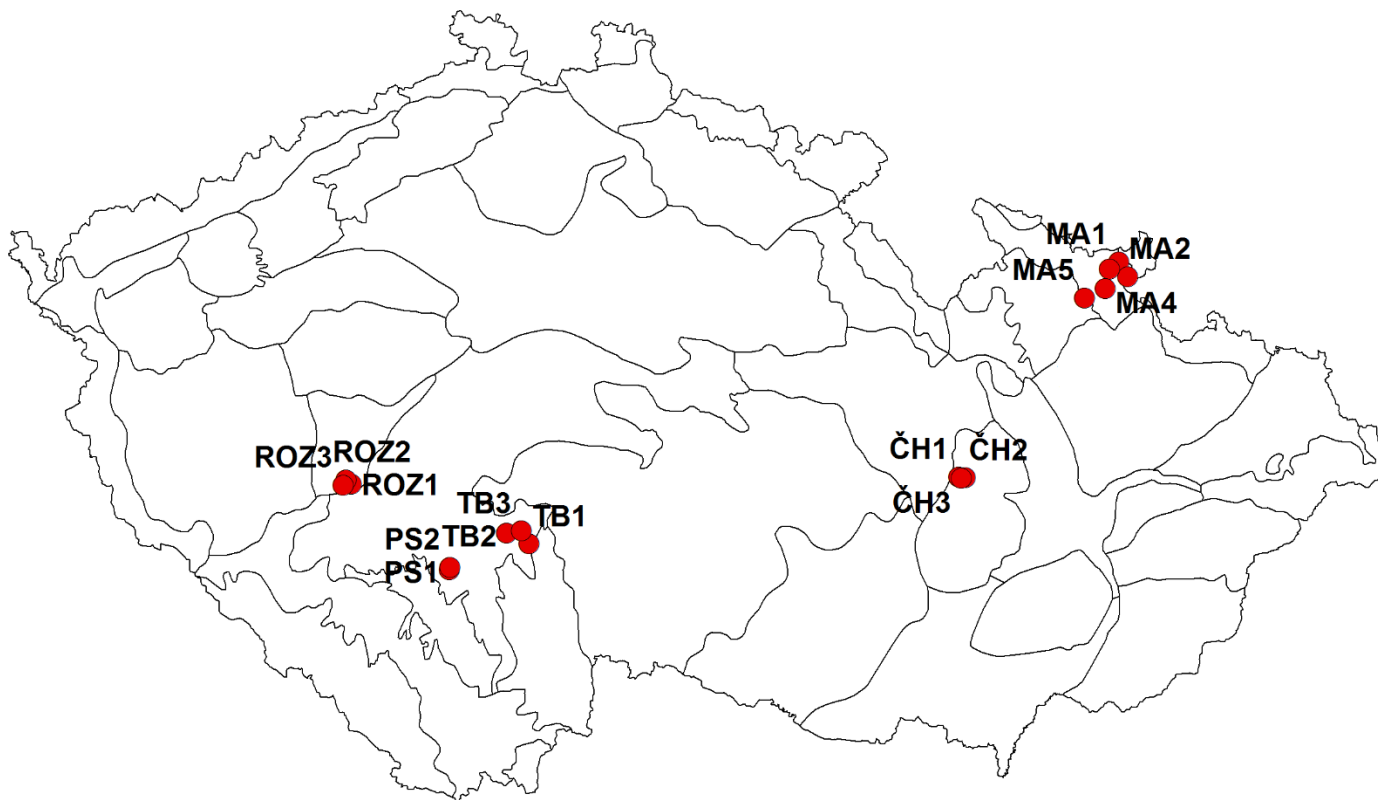
# Objective

to analyse the growth pattern and spatio-temporal variation in the climate-growth response of Silver fir (Sf), Norway spruce (Ns) and European larch (El) along the altitudinal gradient



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# Sample sites



Region	Site	Species sampled	Stand age	Altitude
Tábor	TB1	Sf, Ns	98	441
	TB2	Sf, Ns	135	460
	TB3	Sf, Ns	127	410
Rožmitál	ROZ1	Sf, Ns	116	590
	ROZ2	Sf, Ns	195	775
	ROZ3	Sf, Ns	113	705
Písek	PS1	Sf, Ns	108	430
	PS2	Sf, Ns	108	410
Černá hora	CH1	Sf, Ns, El	99	610
	CH1	Sf, Ns	107	540
	CH1	Sf, Ns	120	540
Město Albrechtice	MA1	Sf, El	115	340
	MA2	Sf, El	137	450
	MA3	Sf, Ns, El	124	540
	MA4	Sf, Ns, El	169	640
	MA5	Sf, Ns	187	710



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# Methods

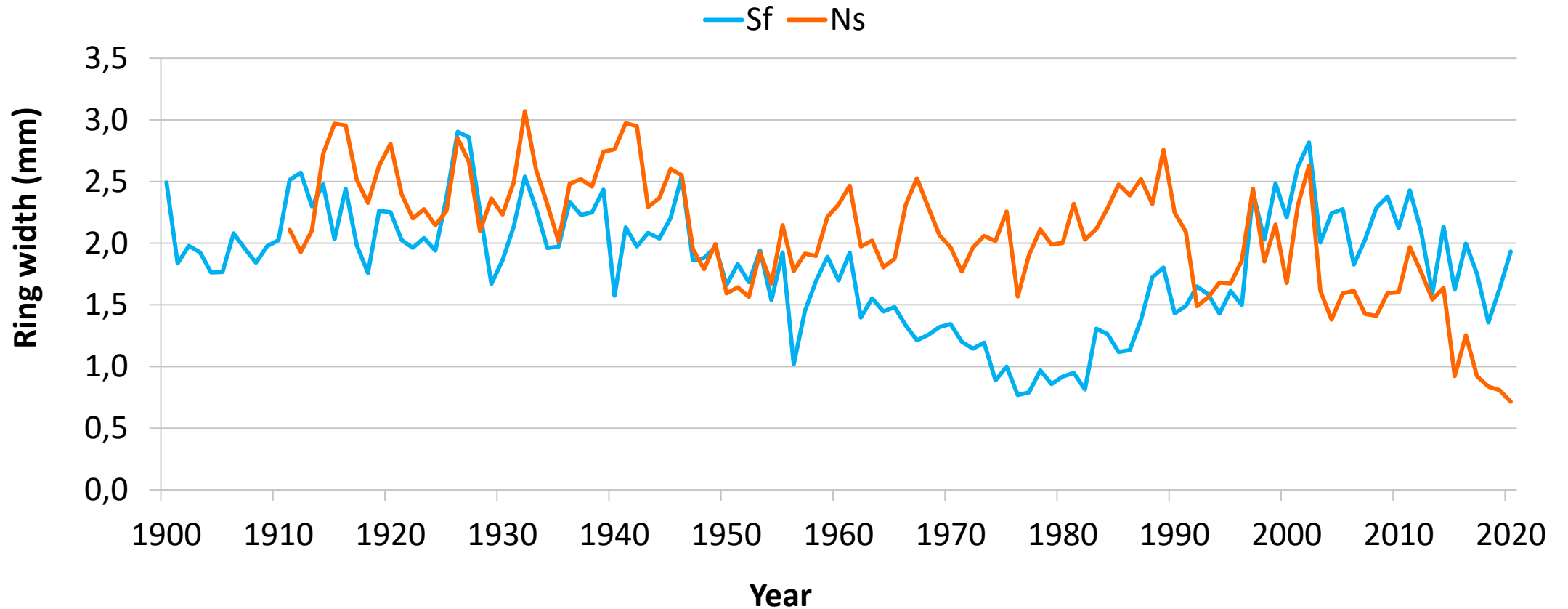
The growth performance of Silver fir was compared to Norway spruce and/or European larch growing in the same site conditions.

- Missing rings and significant growth decline – indication of stress periods
- PCA - the similarity in growth pattern between different tree species and different regions
- Correlation analysis - tree response to key climatic variables
- Moving correlation function - temporal changes of the climate–growth relationship



# Results

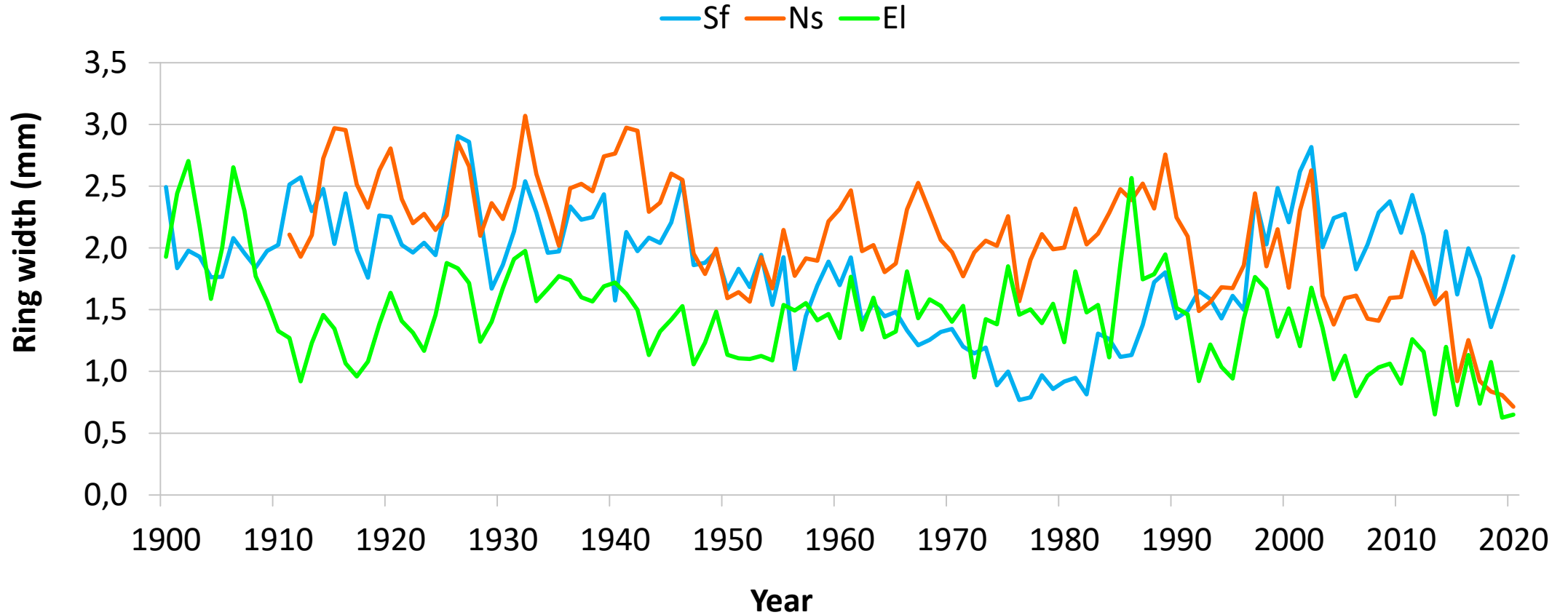
Mean ring-width series for Silver fir (Sf) and Norway spruce (Ns)



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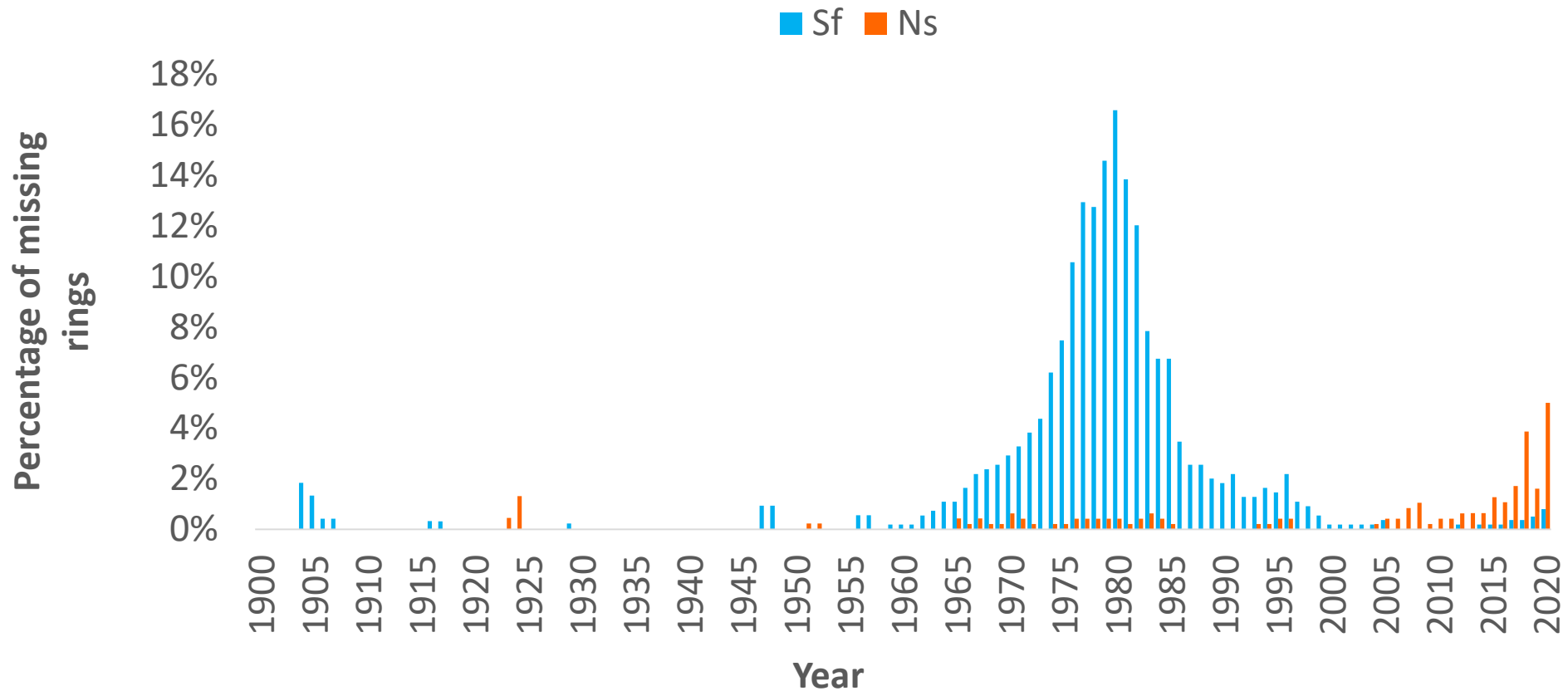
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# Results

PCA loading plots of residual ring-width chronologies for common period 1962-2018

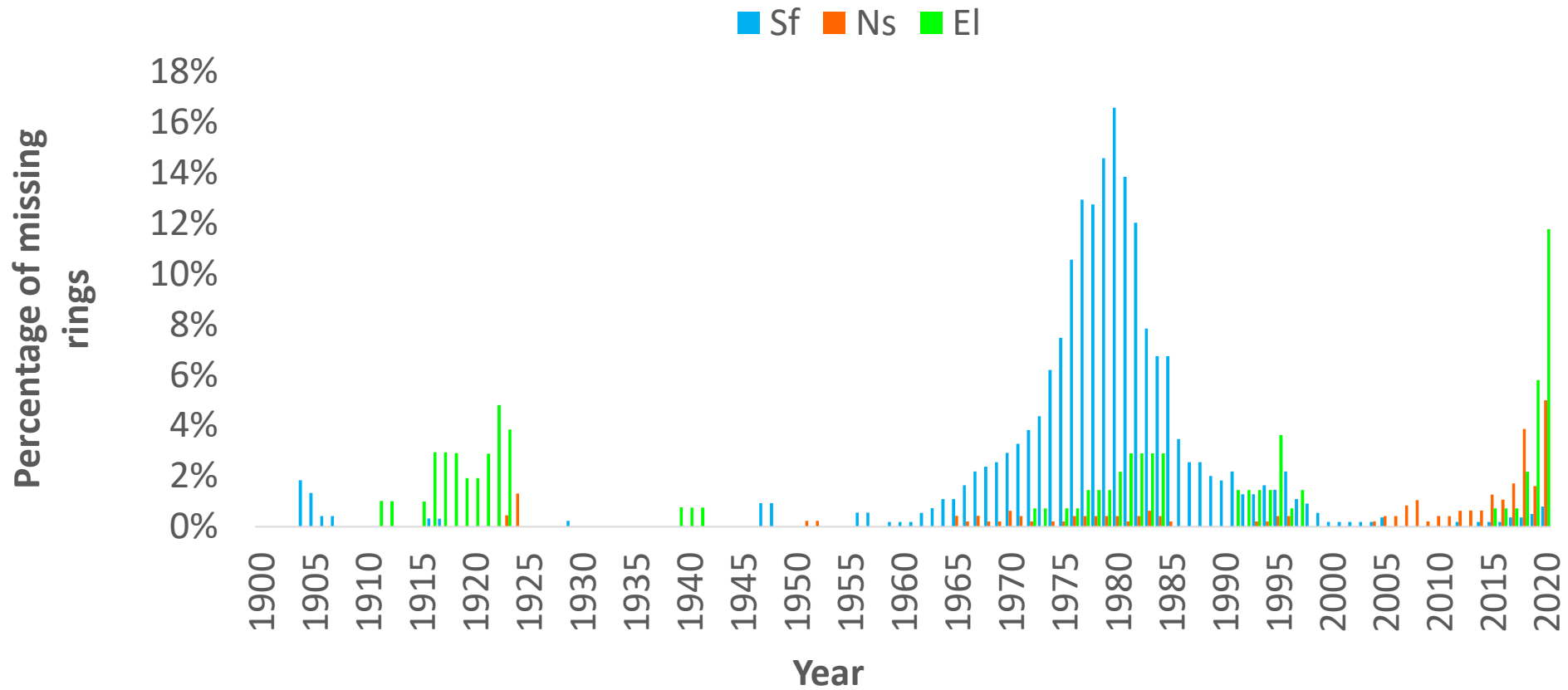


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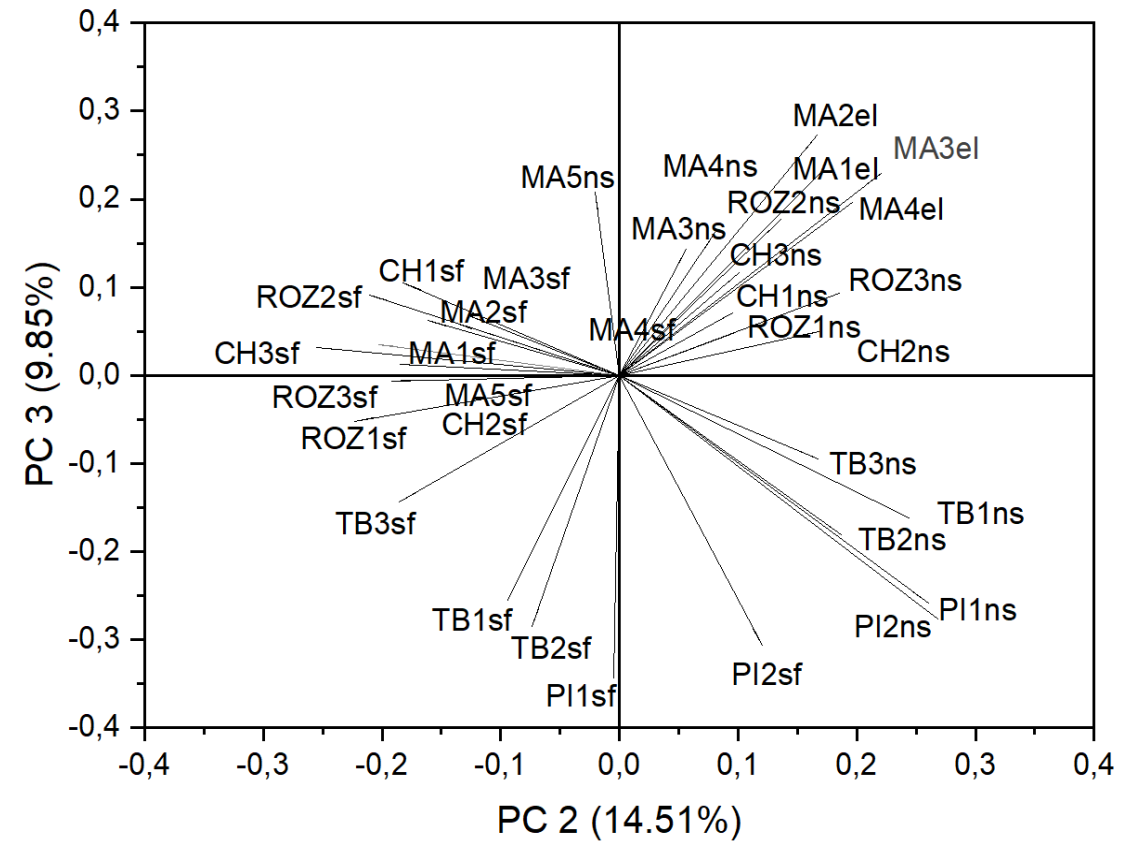
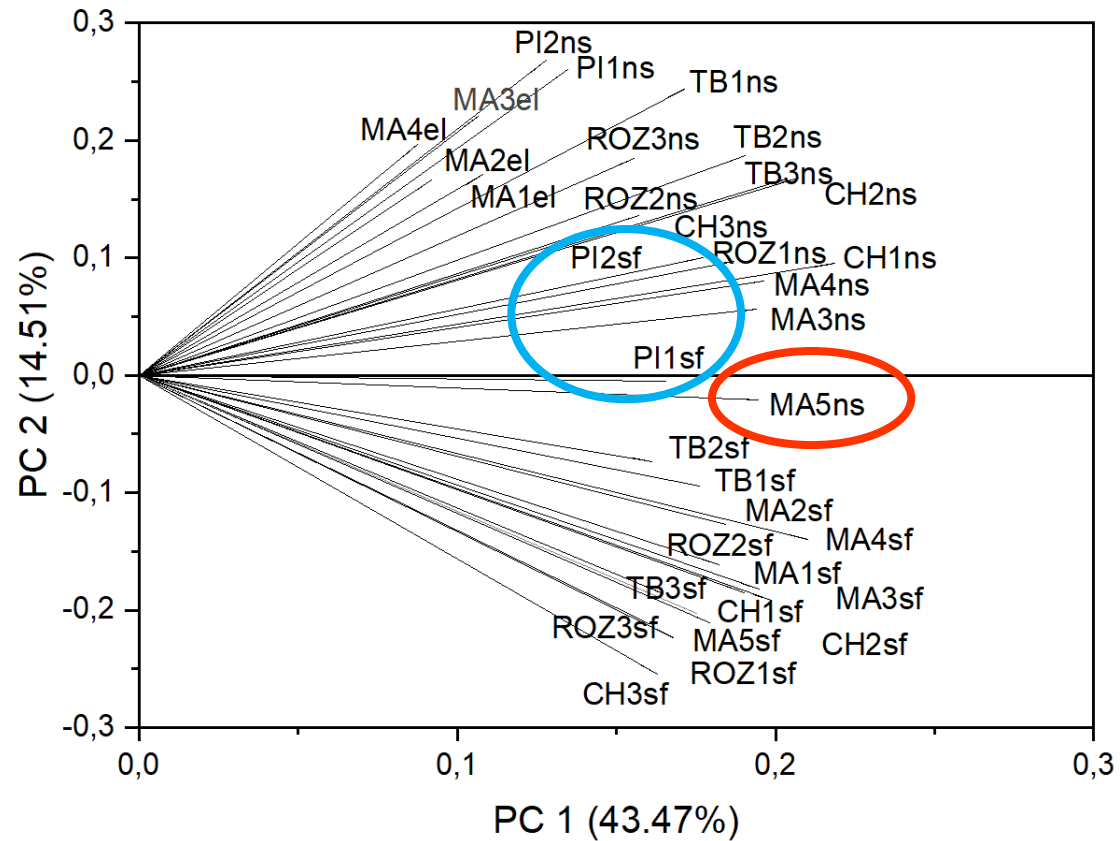
PCA loading plots of residual ring-width chronologies for common period 1962-2018



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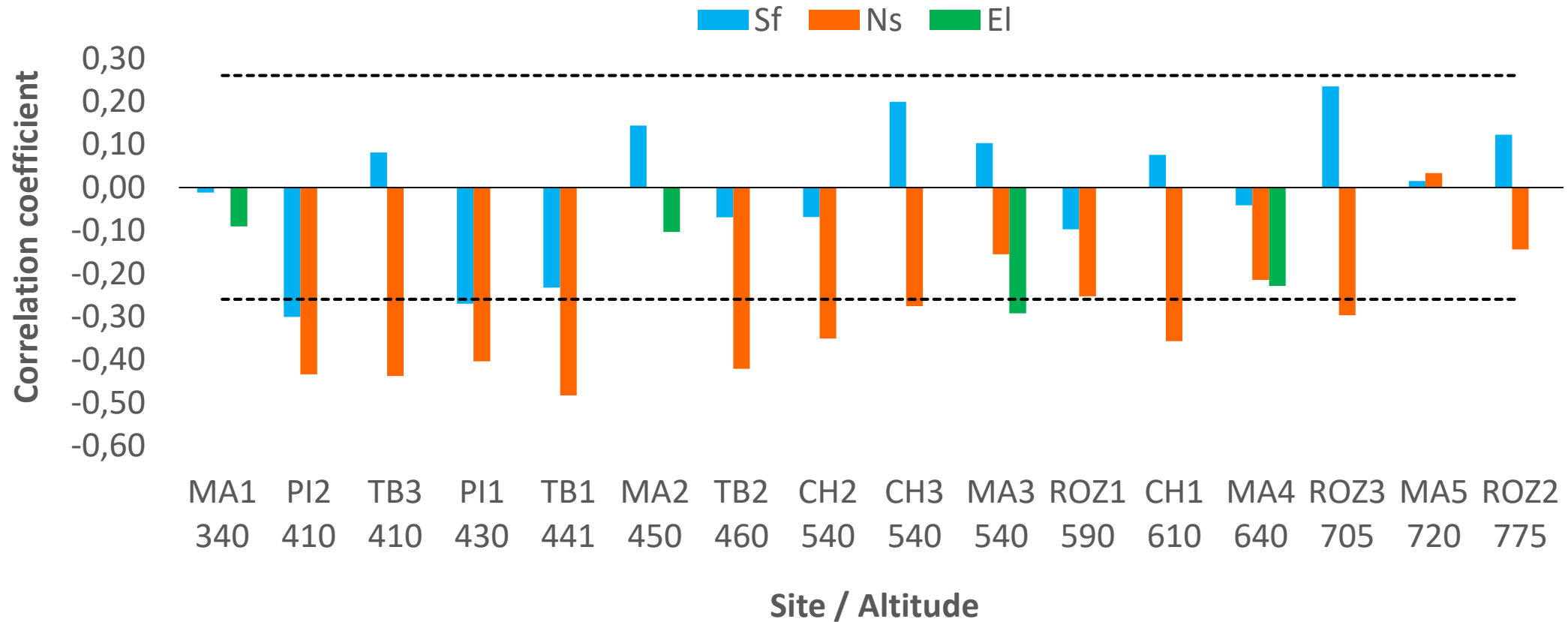
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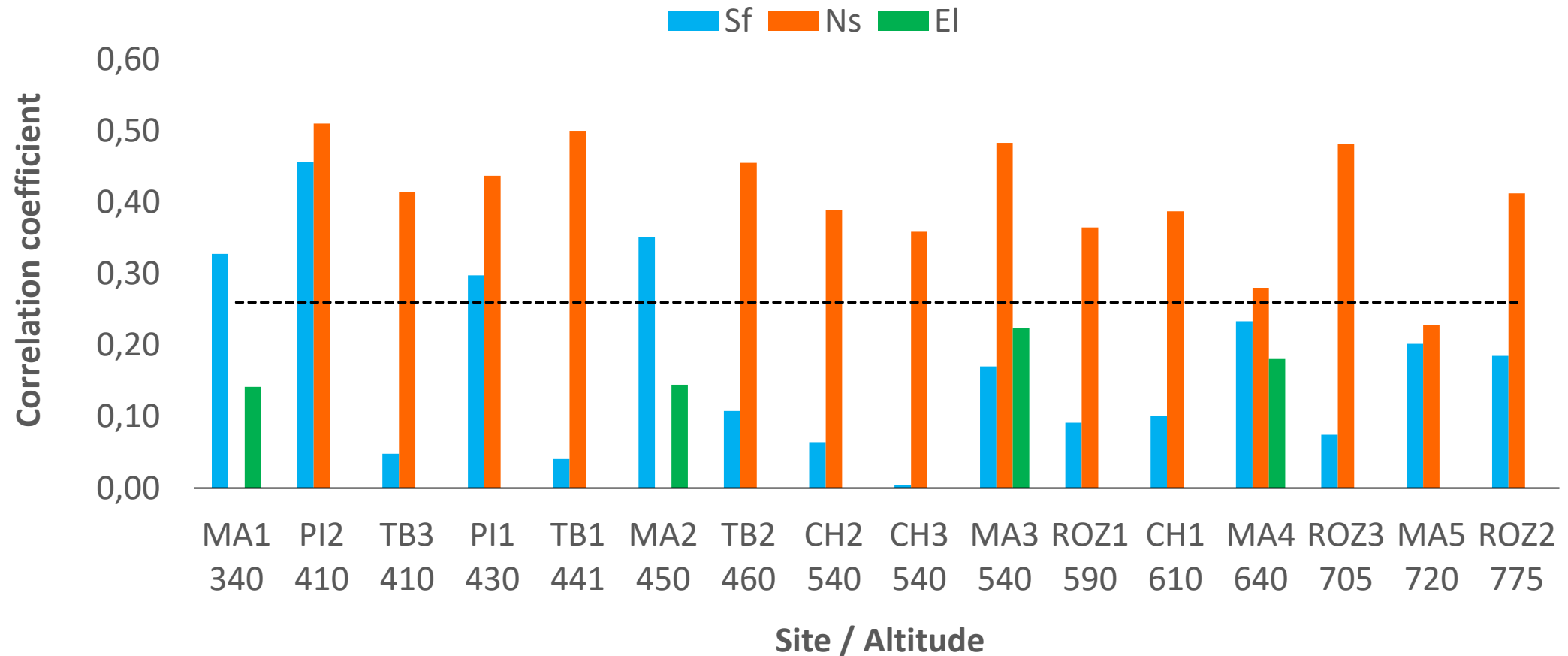
# Results

Correlation of ring-width chronologies with mean summer temperature in the period 1962-2018



# Results

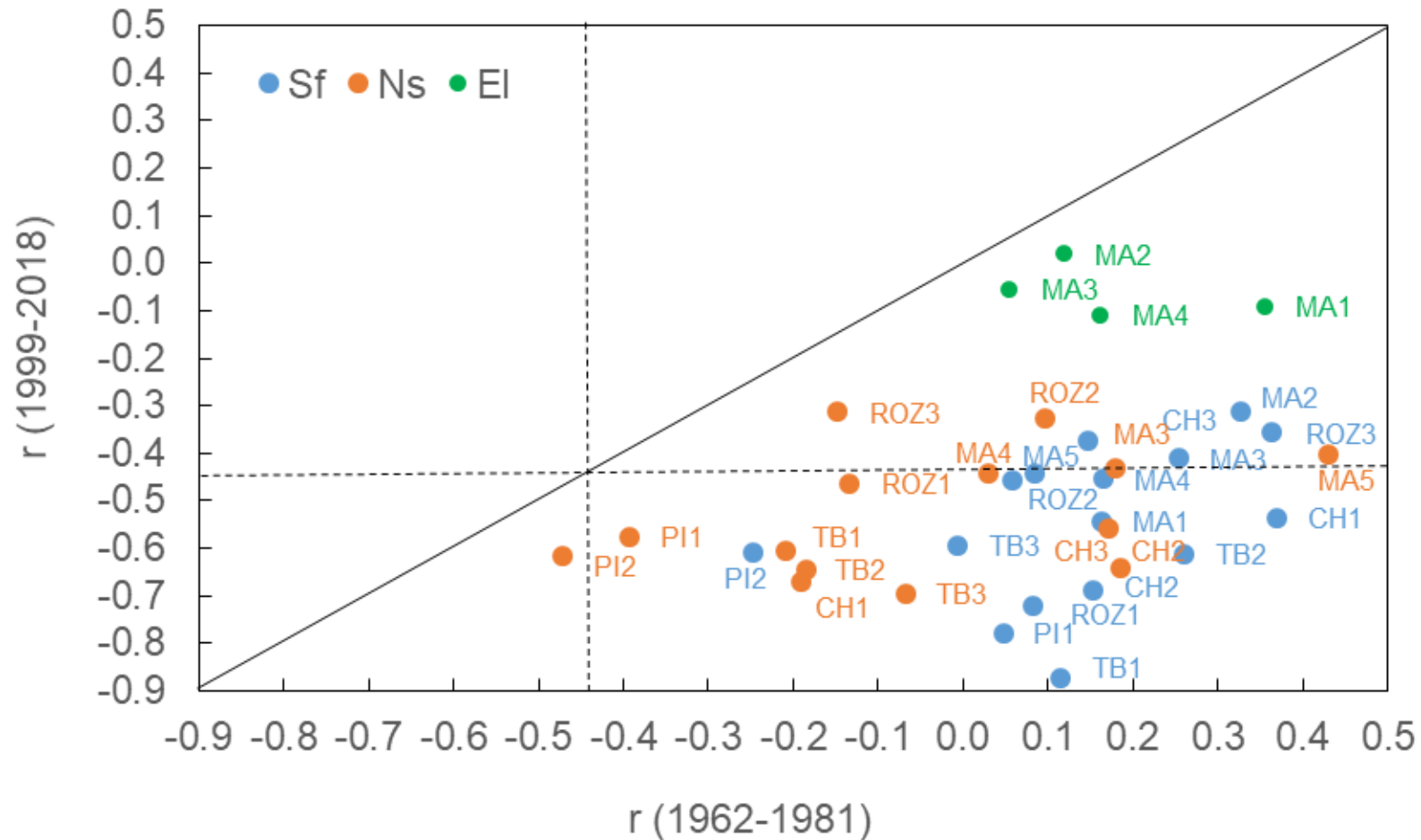
Correlation of ring-width chronologies with summer precipitation totals in the period 1962-2018





# Results

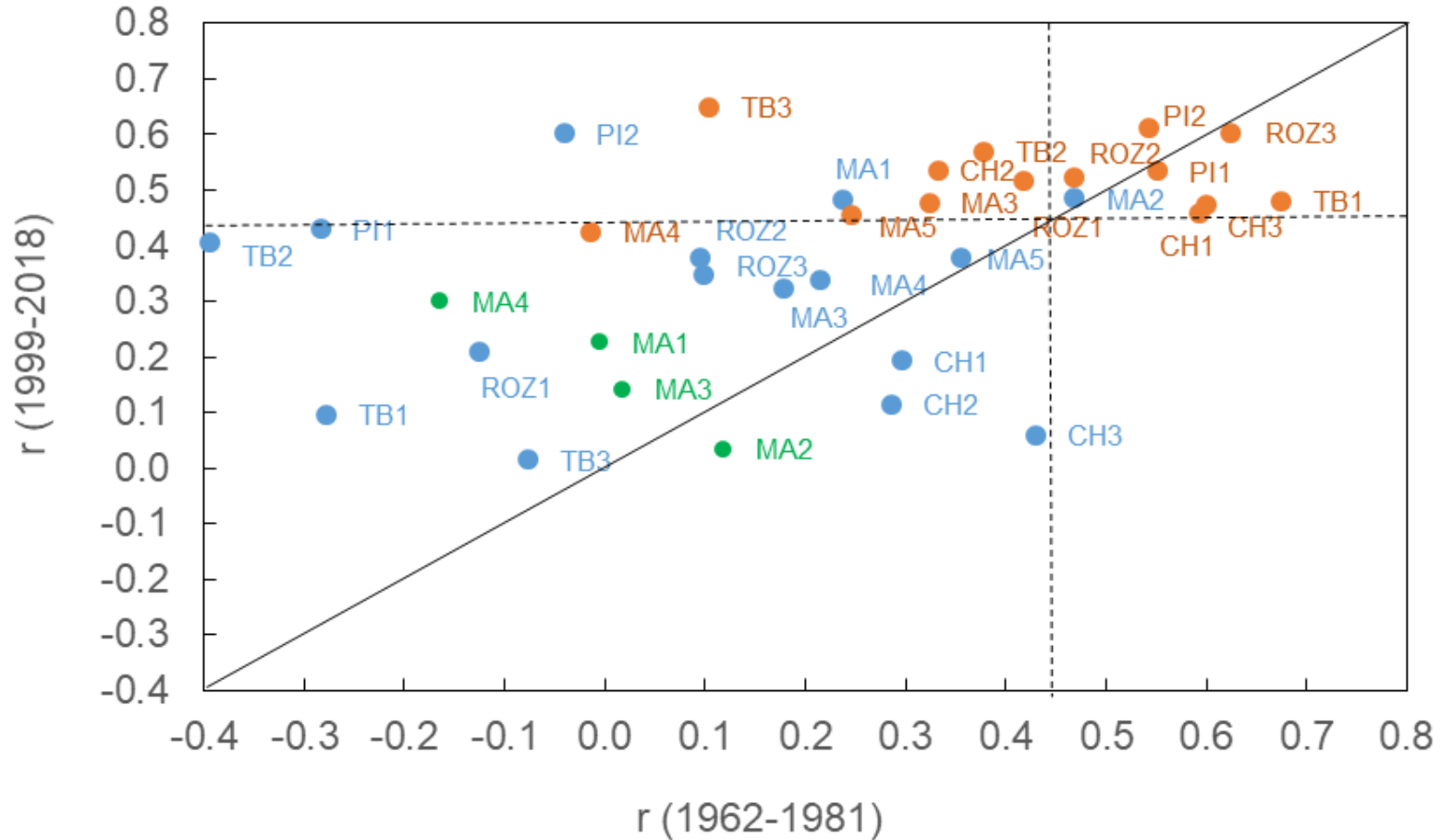
Overall stability of the individual climate-growth relationships expressed by correlation values for summer temperatures



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# Results

**Overall stability of the individual climate-growth relationships expressed by correlation values for summer precipitation**



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# Conclusions

- In the period 1962-2018, fir showed a significantly lower sensitivity to summer drought compared to spruce.
- However, in the last two decades, the susceptibility of fir to high summer temperatures has increased.
- Larch was the less sensitive tree species to drought, nevertheless, low increment and occurrence of missing rings were identified even with this species after 2015.







Thank you for your attention !



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