Effect of Climate in Resistance and Resilience of South Moravian Floodplain Forest

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Hypotheses

1. Oak and ash respond differently to climate change and groundwater level alteration;
2. Species-specific response differs among the sites with different water management.

Methods

- Four stands of similar climatic conditions but different underground water status were chosen in South Moravian floodplain forest: Soutok, Lanzhot, Pohansko, and Lednice.
- Two cores at breast height from the opposite sides were collected from 20 dominant or co dominant trees per species per site using a 0.5mm increment borer (Haglof Sweden).
- Tree ring widths were measured under Leica optical microscope and cross-dated using PAST4 software. Basal area increment (BAI) were calculated for the individual trees.
- Resistance and resilience were calculated from the detrended BAI values with the equations:

$$Rt = Dr/PreDr;$$

$$Rs = PostDr/PreD,$$

where *Rt* – resistance; *Rs* - Resilience; *Dr* - growth during disturbance; *PreDr* - growth before the disturbance; *Rs* - resilience; *PostDr* - growth after the disturbance.

- Climatic and groundwater data were obtained from KNMI database
- Correlation analysis was performed for tree ring growth and monthly climatic values using Pearson correlation.

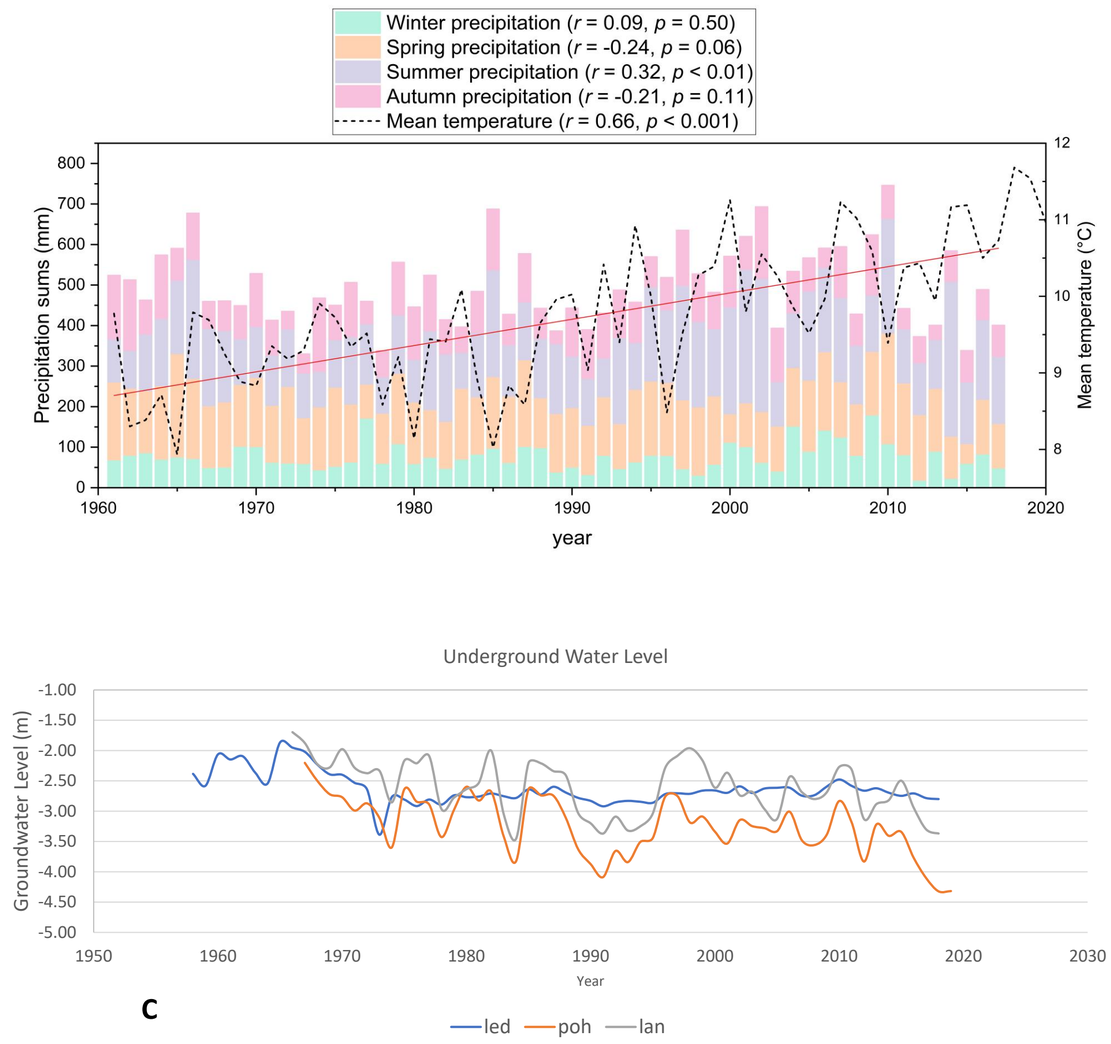

Fig. 1. a) Mean annual temperature and seasonal precipitation for 1960 – 2022; b) groundwater level from surface in three study locations

Results

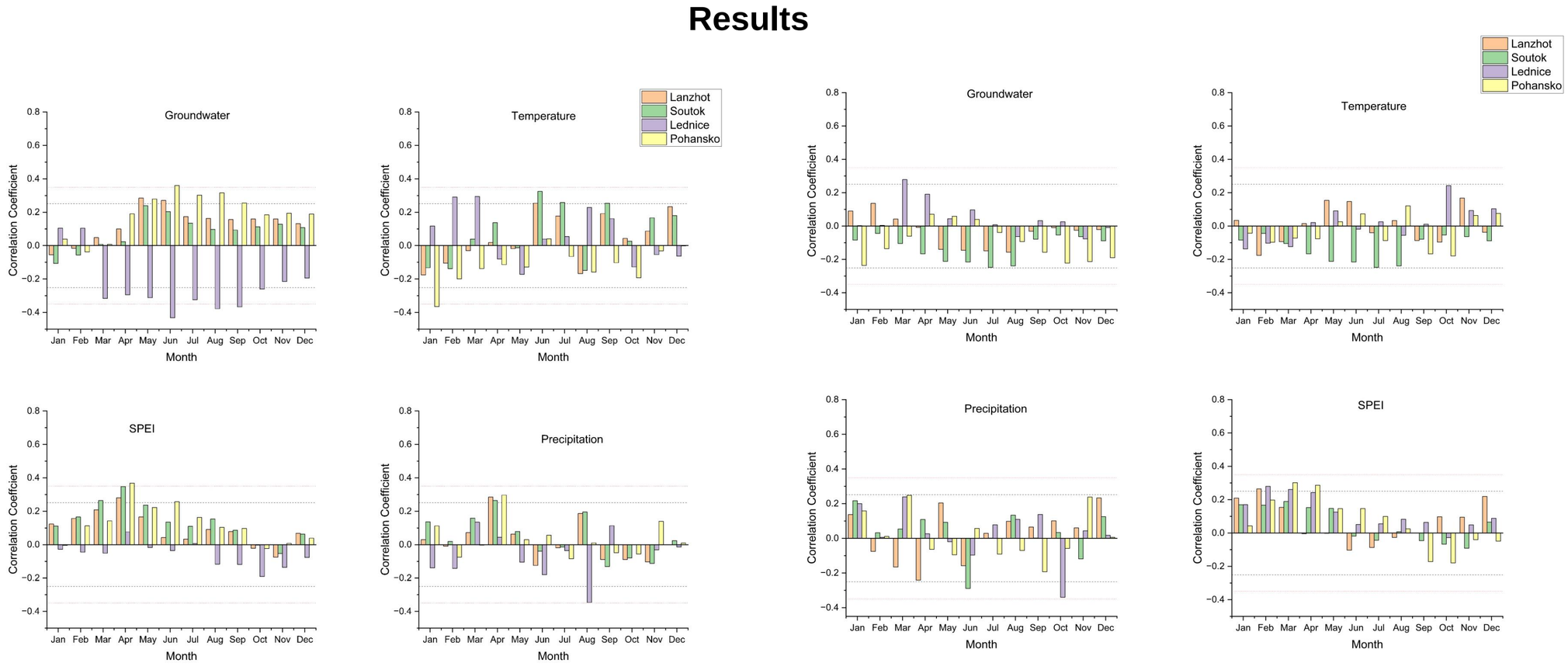

Fig. 2. Pearson correlation with resilience indices (a) ash and (b) oak with climatic parameters (groundwater level, precipitation, mean air tempearature, and SPEI. Black dotted line is the significance level at 0.05 and red dotted line is the significance level at 0.01)

Conclusions

1. Oak resilience shows stronger correlation with Groundwater than ash at all study sites, however in Lednice the groundwater response to resilience is stronger and opposite to other sites.
2. Tree growth at all four plots shows similar correlation pattern with $SPEI_6$ in spring and summer, though in Lednice correlation between oak resilience and SPEI is weaker and is never significant.
3. There is a negative correlation between ash resilience and mean air temperature. In Soutok the strongest correlation values can be seen during the summer months.
4. Sites with deeper groundwater level reveal higher sensitivity to drought.

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