

Figures

Fig.1 Temporal trend of (a) annual precipitation (mm) and SPEI₁₂, (b) *VPD* (kPa) and *VPD* anomaly (z-score) during the whole study period. The SPEI value of 0.5 was used as benchmarks below which drought stress occurred. S0 stands for conditions when SPEI values above -0.5, SI for SPEI values from -1.0 to -0.5, SII for SPEI values from -1.5 to -1.0. *VPD* anomaly was calculated as deviation of individual annual *VPD* value to the mean of the study period.

Fig. 2 BAI (a) and iWUE (b) chronologies of the normal, dieback I and dieback II classes during the whole study period. Values are given as means \pm SE. The distributions of the BAI and iWUE are also given in the box plots. Significant differences ($p < 0.05$) among different vigor classes are indicated with different lower-case letters.

Fig. 3 Temporal series of tree-ring $\delta^{13}\text{C}$ (a), C_i (b) and $\Delta^{13}\text{C}$ (c) of the currently normal (N), dieback I (DI) and dieback II (DII) stands during the whole study period. Values are given as means \pm SE. The distributions of the variables are also given in the box plots. Significant differences ($p < 0.05$) among different vigor classes are indicated with different lower-case letters.

Fig. 4 BAI in relationship with iWUE (a), C_a (air CO_2 concentration) (b) and the tree-ring $\delta^{13}\text{C}$ (c) of different vigor classes during the whole study period. Data points represent the mean annual values in each health class. The error bars were omitted considering the clarity of figures.

Significant relationships are indicated by solid lines (fitting-curves for trends after 1997) and dashed lines (significant trends before 2000). The significance of differences in the trends between BAI and corresponding variables among vigor classes were tested using analysis of covariance (ANCOVA). P_{post} stands for p value after 2000, and P_{ante} for p value before 1997.

Fig. 5 Comparison of actual iWUE with the three scenarios for the theoretical stomatal gas regulation in response to air CO_2 : constant intercellular CO_2 (C_i), constant C_i/C_a and constant $C_a - C_i$

Fig. 6 Soil moisture(a) and available nitrogen (b) of all health classes. Significant differences of available nitrogen among different soil depths were indicated with lower case letters.

Fig. 7 Water source contribution from different soil layers of all health classes. Black dots represented the average values of corresponding layer.

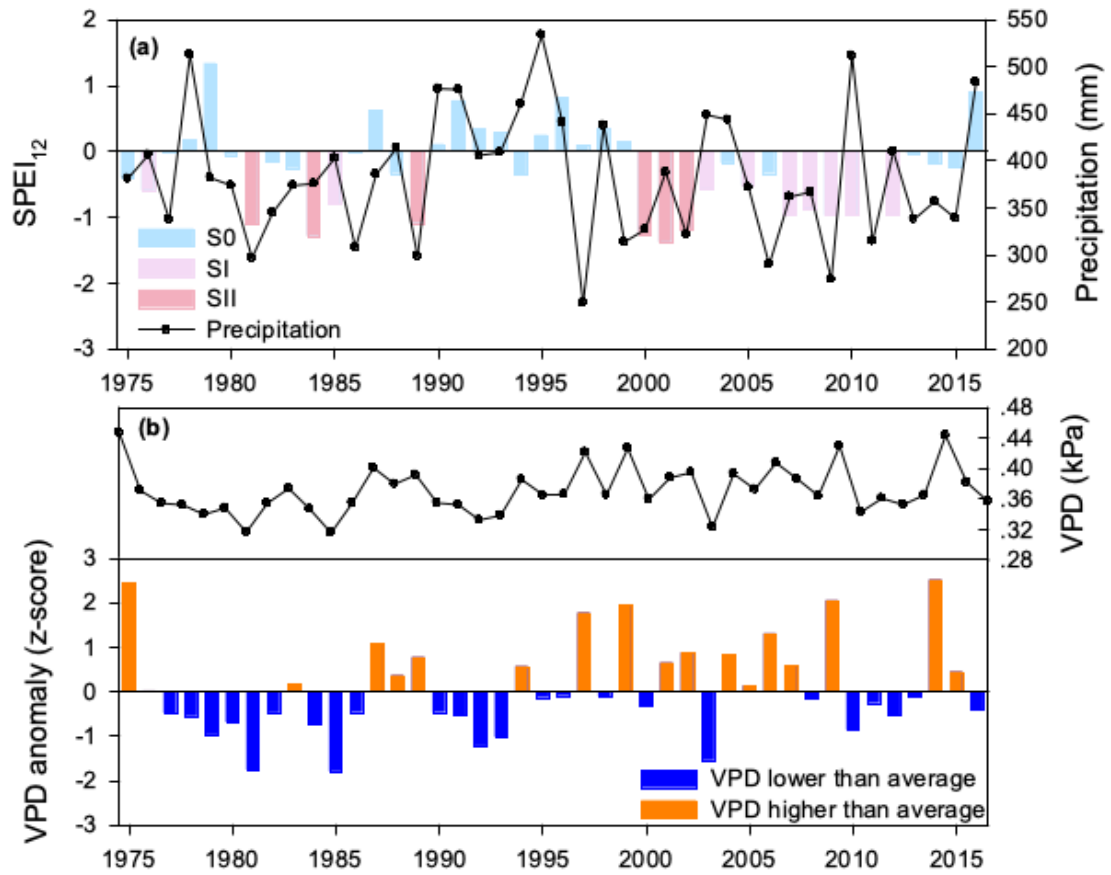


Fig.1 Temporal trend of (a) annual precipitation (mm) and $SPEI_{12}$, (b) VPD (kPa) and VPD anomaly (z-score) during the whole study period. The $SPEI$ value of 0.5 was used as benchmarks below which drought stress occurred. S0 stands for conditions when $SPEI$ values above -0.5, SI for $SPEI$ values from -1.0 to -0.5, SII for $SPEI$ values from -1.5 to -1.0. VPD anomaly was calculated as deviation of individual annual VPD value to the mean of the study period.

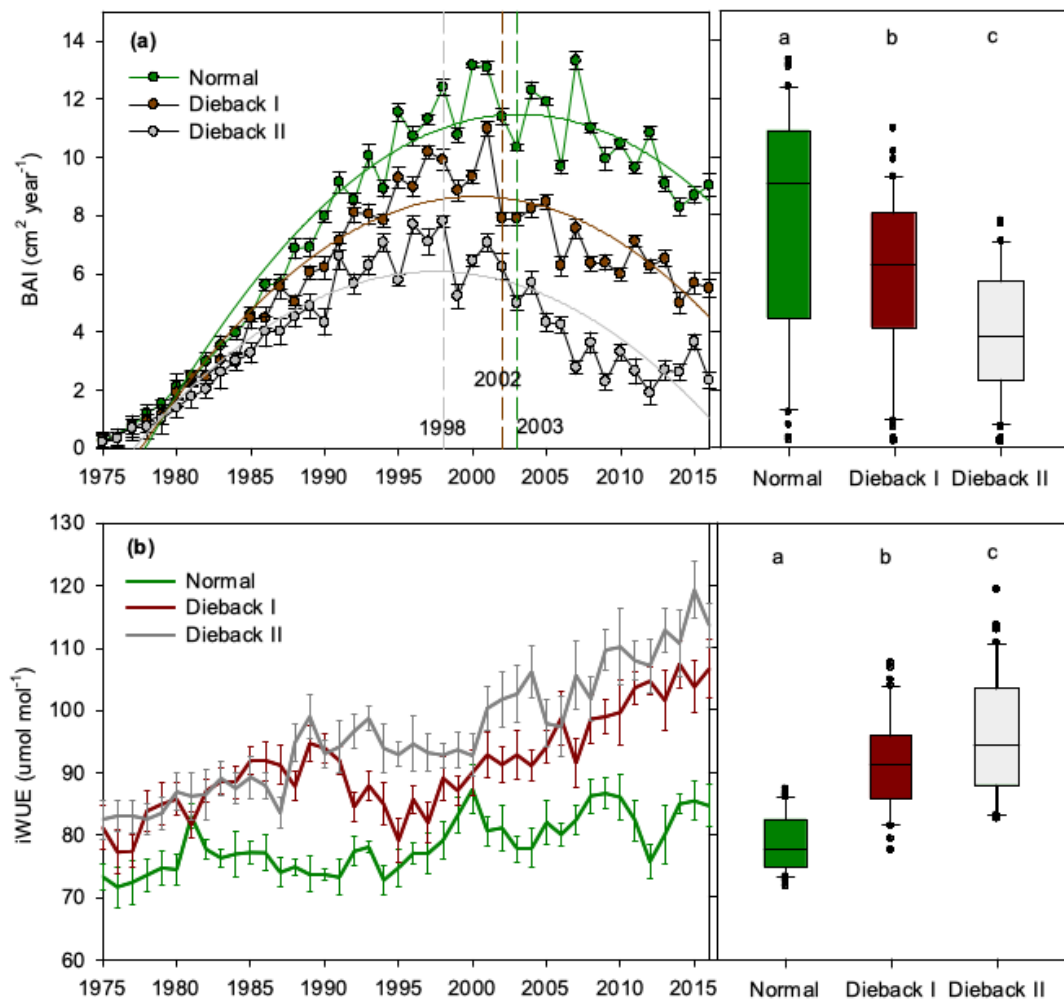


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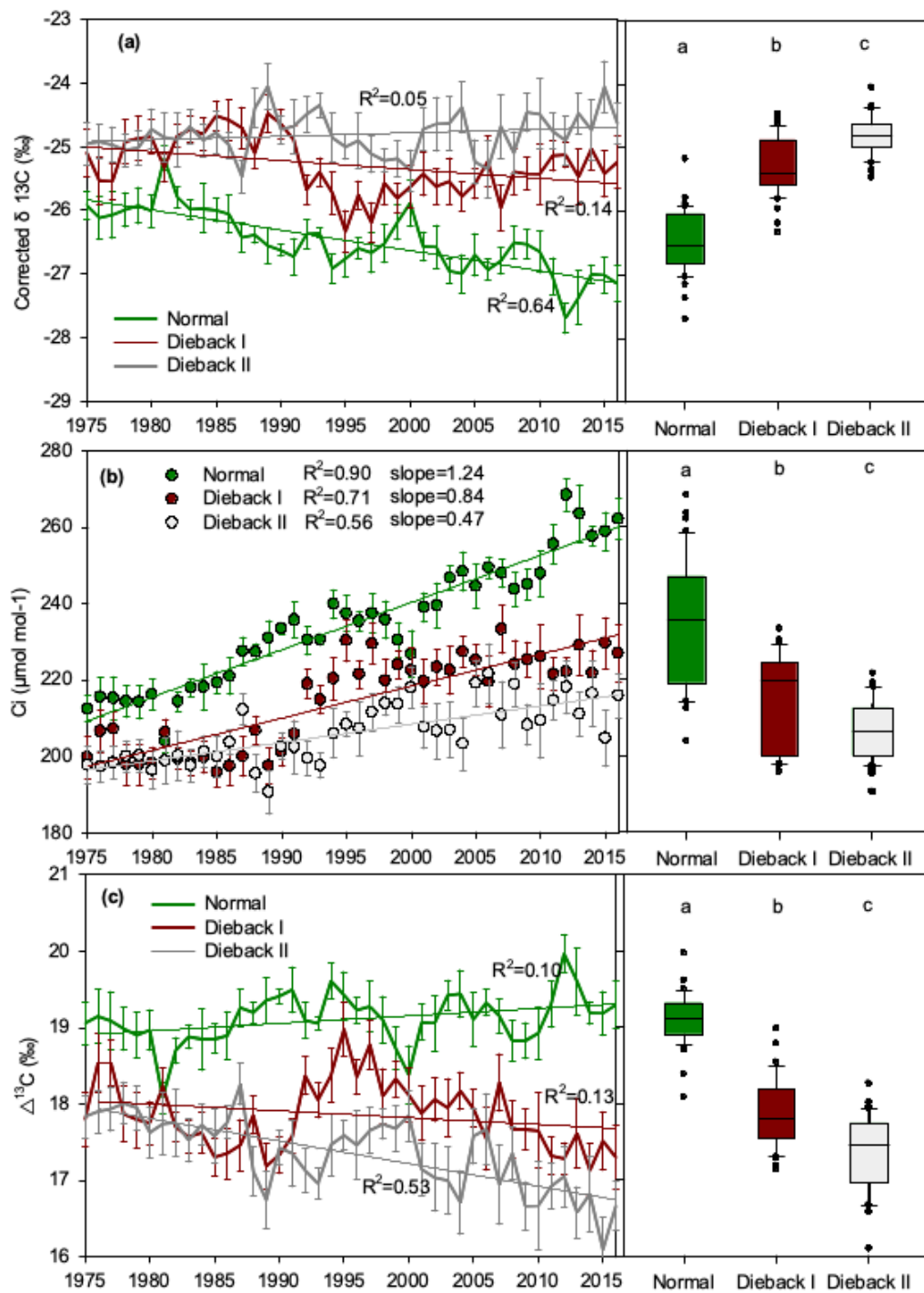


Fig. 3 Temporal series of tree-ring $\delta^{13}\text{C}$ (a), Ci (b) and $\Delta^{13}\text{C}$ (c) of the currently normal (N), dieback I (DI) and dieback II(DII) stands during the whole study period. Values are given as means \pm SE. The distributions of the variables are also given in the box plots. Significant differences ($p < 0.05$) among different vigor classes are indicated with different lower-case letters.

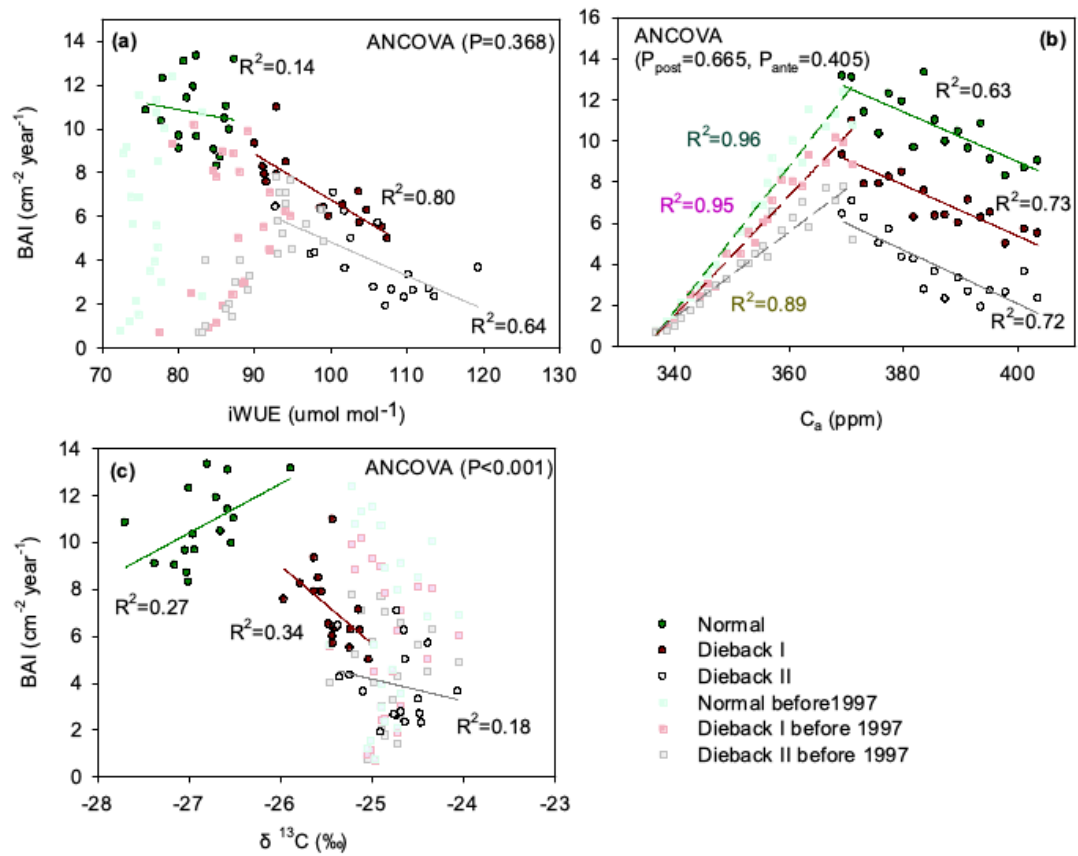


Fig. 4 BAI in relationship with iWUE (a), C_a (air CO₂ concentration) (b) and the tree-ring δ¹³C(c)

of different vigor classes during the whole study period. Data points represent the mean annual

values in each health class. The error bars were omitted considering the clarity of figures.

Significant relationships are indicated by solid lines (fitting-curves for trends after 1997) and

dashed lines (significant trends before 2000). The significance of differences in the trends between

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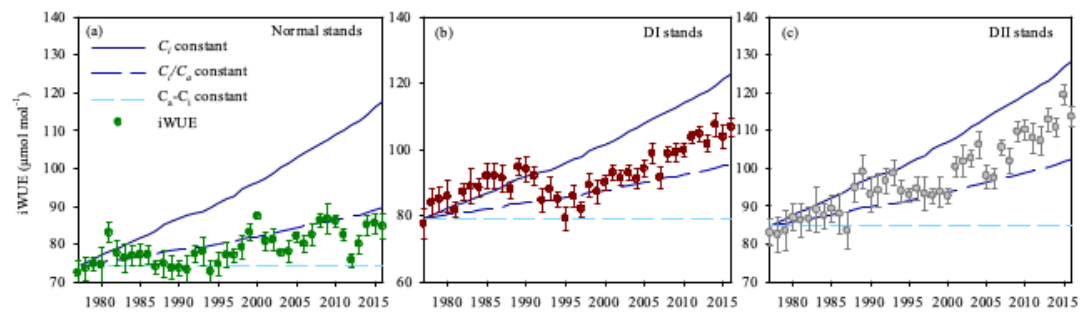


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regulation in response to air CO_2 : constant intercellular CO_2 (C_i), constant C_i/C_a and constant C_a-C_i

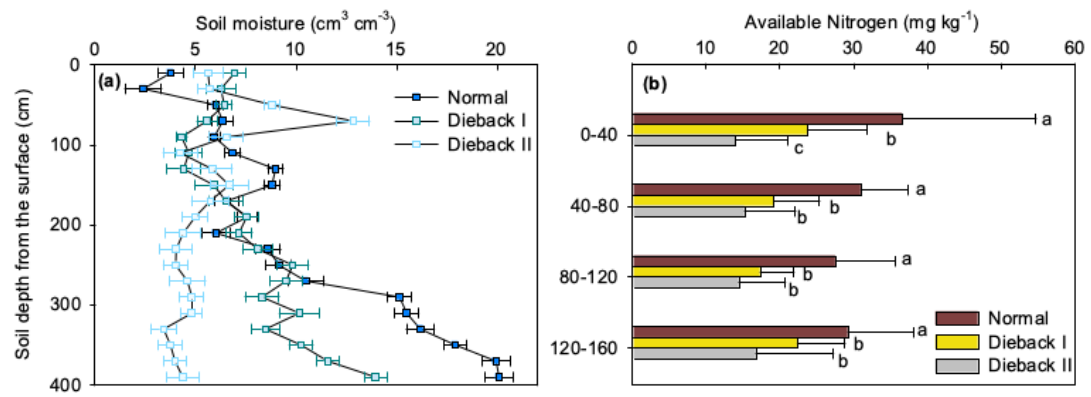


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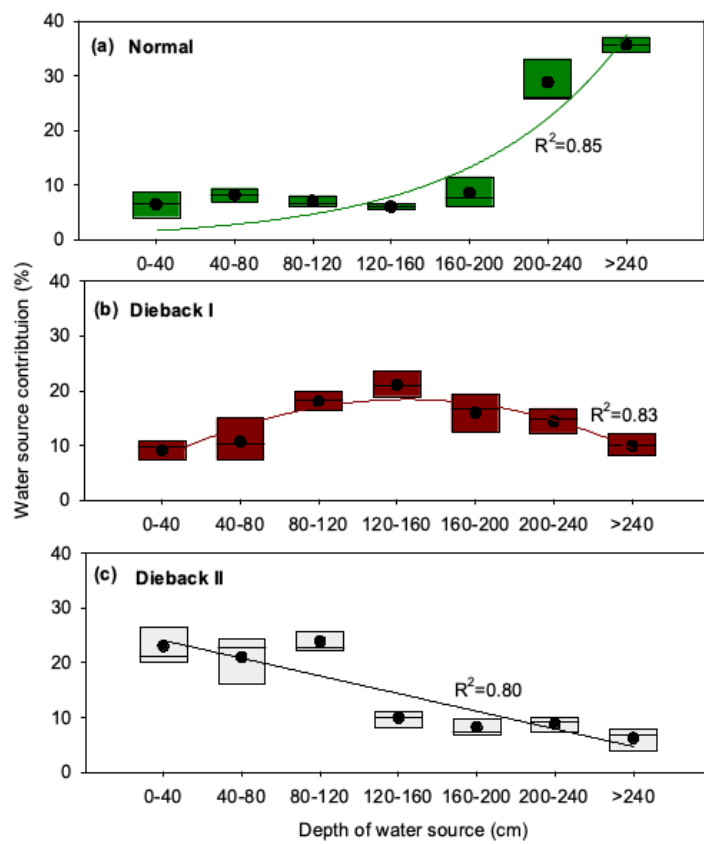


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