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Effects of heat and drought on carbon and water dynamics in a regenerating semi-arid pine forest: a combined experimental and modeling approach

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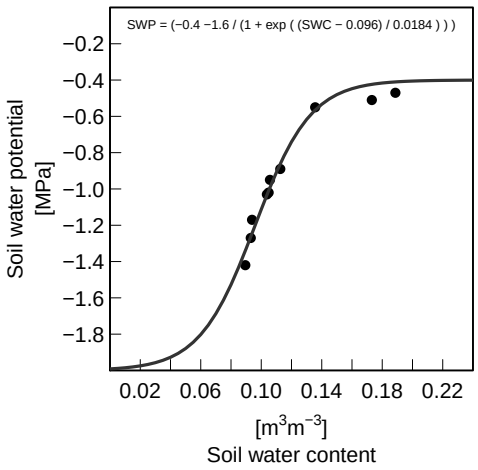

Figure S1: Relationship of soil water potential (SWP) with soil water content (SWC, 10–90 cm depth), described by a sigmoid function (R^2= 0.98), assuming a SWP of −2 MPa at SWC of 0 m^3m^{-3} (−1.8 MPa was minimum leaf water potential measured midday).

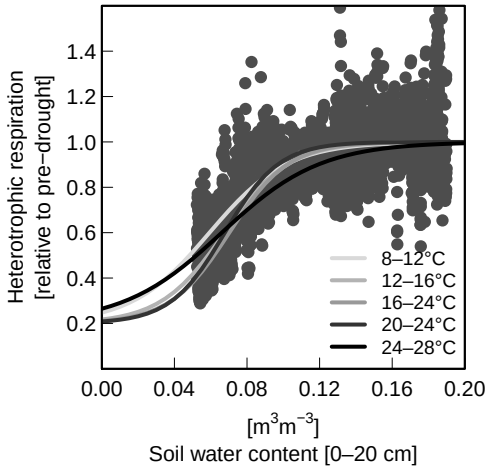

Figure S2: Heterotrophic respiration (Rh) relative to pre-drought conditions (0.15 < SWC < 0.19) vs. soil water content of half-hourly measurements during the summer 2011. The relationship of Rh relative to pre-drought conditions with SWC is described by sigmoid functions (R^2= 0.67–0.75) for 5 different temperature classes. The sigmoid function for the temperature class 16–24 °C (average soil temperature during summer) used to describe the drought-sensitivity in the model is: $y = 0.2 + 0.8 / (1 + \exp(-(SWC - 0.07) / 0.016))$.

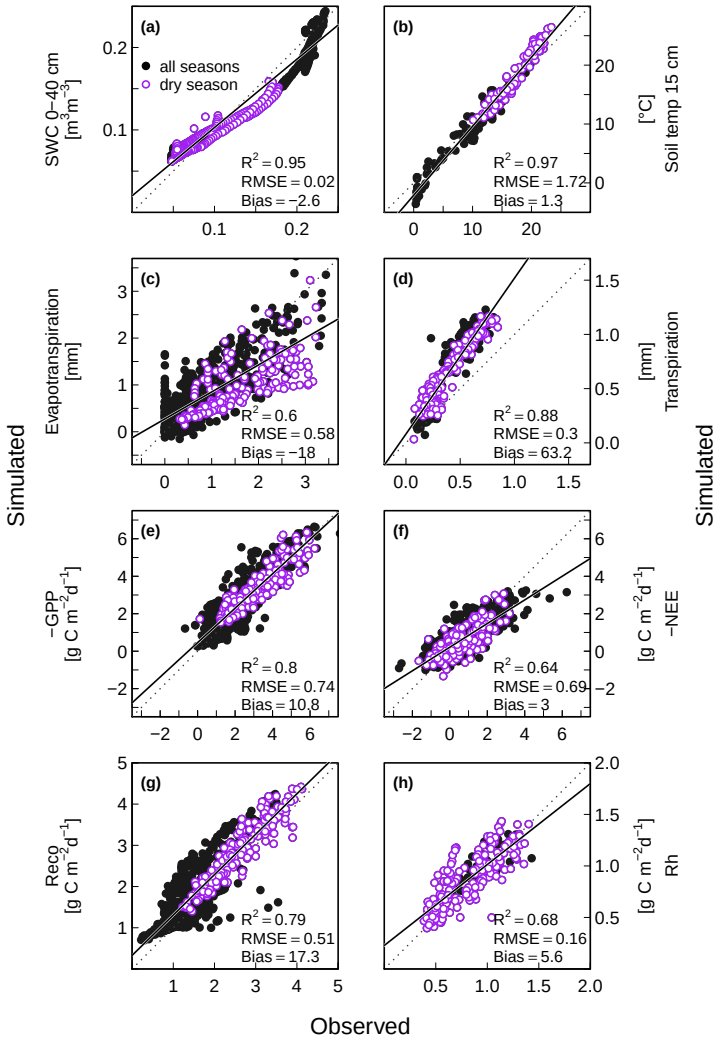

Figure S3: Relationship between simulated and observed daily averages in 2010 and 2011. The regression between simulated and observed values for all seasons is provided by the solid line, and the R^2, RMSE (root mean square error) and percent mean bias are given. The dry seasons (July, August and September) are highlighted with the open circles (see legend), and the ideal one-to-one relationship is depicted by the dotted line.

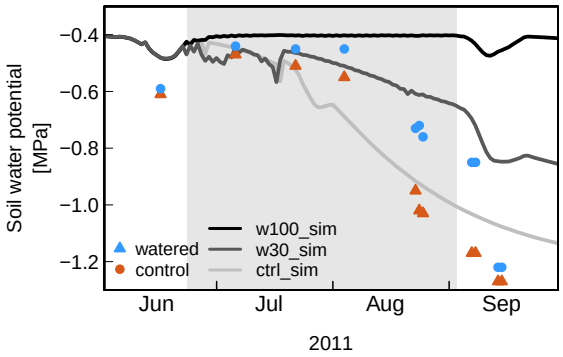

Figure S4: The dynamics of observed and simulated soil water potential (SWP; i.e. predawn leaf water potential) for control and watered treatment during the summer 2011. The simulation run $w100_{sim}$ equals the irrigation treatment and the $w30_{sim}$ simulates 30% of the water added. The duration of the watering treatment is highlighted by the gray area. Note the relative good accordance of the field watered treatment with the $w30_{sim}$ during the irrigation period, and fast declines of observed SWP thereafter. Observed SWP for the control matched the simulation ($ctrl_{sim}$) relatively well, but was overestimated by the model in September.