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

NADINE K. RUEHR[1,*], BEVERLY E. LAW[2], DUSTIN QUANDT[2], and MATHEW WILLIAMS[3]

[1]*Karlsruhe Institute of Technology, Institute of Meteorology and Climatology - Institute of Atmospheric Environmental Research, 82467 Garmisch-Partenkirchen, Germany*

[2]*Oregon State University, College of Forestry, Department of Forest Ecosystems & Society, Corvallis, OR 97331, USA*

[3]*University of Edinburgh, School of GeoSciences, Edinburgh EH9 3JN, UK*

[*]Correspondence: email: nadine.ruehr@kit.edu

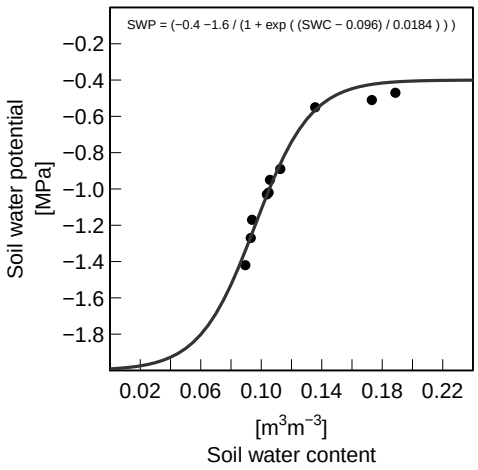

Figure S1: Relationship of soil water potential (SWP) with soil water content (SWC, 10–90 cm depth), described by a sigmoid function (R^2= 0.98), assuming a SWP of −2 MPa at SWC of 0 m^3m^{-3} (−1.8 MPa was minimum leaf water potential measured midday).

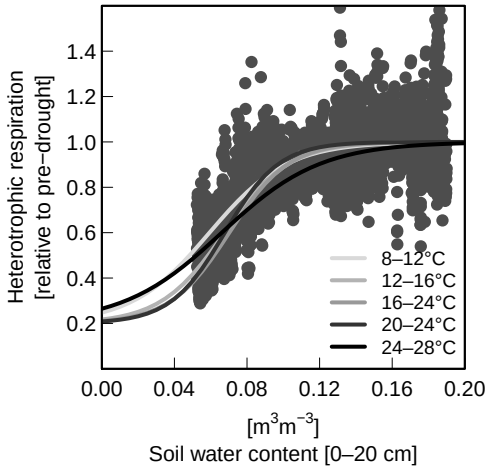

Figure S2: Heterotrophic respiration (Rh) relative to pre-drought conditions (0.15 < SWC < 0.19) vs. soil water content of half-hourly measurements during the summer 2011. The relationship of Rh relative to pre-drought conditions with SWC is described by sigmoid functions (R^2= 0.67–0.75) for 5 different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

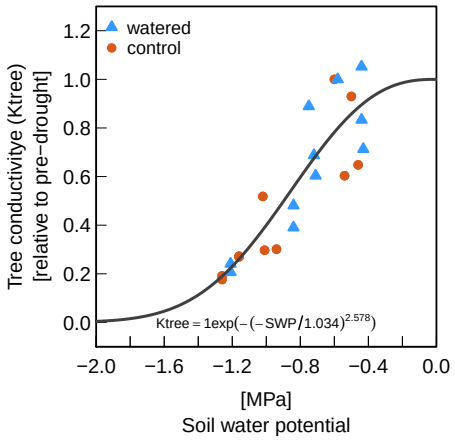

Figure S3: Sensitivity of loss in tree conductivity (K_{tree}) with decreasing soil water potential (SWP) for the control and watered treatment during June to September 2011. The relationship of relative K_{tree} with SWP is described by a Weibull function (R^2= 0.78).

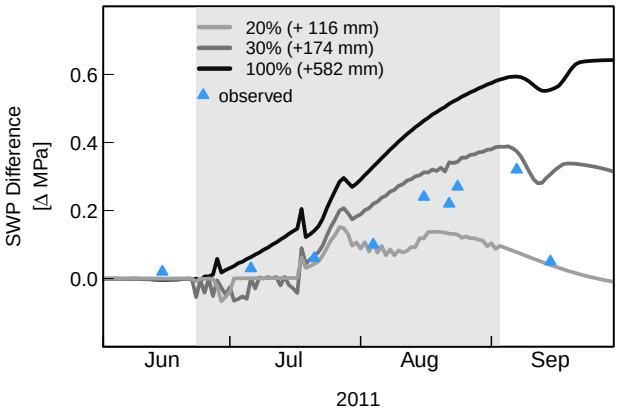

Figure S4: Difference in soil water potential (SWP) under water additions compared to the control ('normal' seasonal summer drought) in summer 2011. Shown are the differences for the observation (derived from pre-dawn water potential measurements of needles) and the simulation runs with the 20%, 30% and 100% water addition scenarios. The duration of the watering treatment is highlighted by the gray box. Note the relative good accordance of observations and 30% scenario during the duration of the treatment, except that 14 days after the end of the watering the difference in SWP of the observations was close to zero (instantaneous decline of SWC), while large differences were predicted by the simulation.