Supplementary Information to

How does soil water availability control phytotoxic O_3 dose to montane pines? Modelling and experimental study from two contrasting climatic regions in Europe

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(Supporting Information includes 2 pages, 1 table)

Part SI-1: Details to section: Methods
DO_3SE model parameterization for version (DO3SE_INTv3.0.5)

The interface of DO_3SE model version 3.0 provides a way to parameterise input variables. A collection of parameters according to built-in preset for coniferous forest (CF) was used for model calculation of ozone exposure (AOT40) and phytotoxic dose (PODy) metrics.

Table S1. Model parameters for coniferous forest (CF) considering for Swiss stone pine and *dwarf mountain pine; G_{max} built-in preset adjusted from value of 160 to **110 mmol O_3 m^{-2} PLA s^{-1} according to field measurements in SK–HT

Input data	
O_3_zR (ppb): Measured O_3 concentration	hourly variables
Ts (°C): Air temperature (AT – abbreviation used in paper)	hourly variables
VPD (kPa): Vapour Pressure Deficit	hourly variables
Uh_zR (m s^{-1}): Wind speed	hourly variables
Precip (mm): Precipitation	hourly variables
P (kPa): Pressure	hourly variables
R (Wh m^{-2}): Global radiation	hourly variables
Measurement data	
O_3 measurement height (m), recalculated	20
O_3 measurement canopy height (m)	Same as target canopy
Wind speed measurement height (m)	10
Wind speed measurement canopy height (m)	Same as target canopy
Soil water measurement depth (m)	0.4
Location properties	
Latitude/Longitude/Elevation	variables
Soil texture type: sandy loam (coarse), silt loam (medium coarse), loam (medium coarse), clay loam (fine)	choice of type
Rsoil (s m^{-1}): Soil resistance to the vertical soil water distribution	200
Vegetation characteristics	
H (m): Canopy height	20/*2
Root (m): Root depth	1.00/*0.5
Lm (m): Cross-wind leaf dimension	0.008
Albedo (fraction)	0.12

G_{max} (mmol O_3 m^{-2} PLA s^{-1}): Maximum stomatal conductance to O_3	**110
Sun/shade factor (fraction)	1.00
f_{min} (fraction): Minimum stomatal conductance to O_3	0.10
R_{ext} (s m^{-1}): External plant cuticule resistance	2,500
Threshold Y for PODy (nmol m^{-2} s^{-1})	1.00
G_{sto0} (µmol m^{-2} s^{-1}): Closed stomata conductance	30,000
m (dimensionless): Species-specific sensitivity to An	16.83
Vcmax (µmol m^{-2} s^{-1}): Maximum catalytic rate at 25°C	30.00
Jcmax (µmol m^{-2} s^{-1}): Maximum rate of electron transport at 25°C	60.00
Environmental response	
$light_a$ (dimensionless): Species-specific parameter for response G_{sto} to photosynthetic photon flux density (PPFD)	0.008
T_{min} (°C): Minimum temperature for G_{sto}	1
T_{opt} (°C): Optimum temperature for G_{sto}	18
T_{max}(°C): Maximum temperature for G_{sto}	36
VPD_{min} (kPa): Vapour pressure deficit for min. G_{sto}	3.3
VPD_{max} (kPa): Vapour pressure deficit for max. G_{sto}	0.6
SWP_{min} (MPa): Soil water potential for min. G_{sto}	-1.20
SWP_{max} (MPa): Soil water potential for max. G_{sto}	-0.76
Model options	
Stomatal conductance model	Multiplicative
Leaf temperature calculation	Estimate
fO_3calculation	Not used (fO_3=1)
Soil water influence on G_{sto}	Use fSWP
LWP calculation	Steady-state (SS)
fSWP calculation	Linear (SWP_{min}, SWP_{max})
Season	1 April–30 September 2016
SGS: Star of growing season	92
EGS: End of growing season	275
LAI_a (m^2 m^2): Leaf area index at SGS	3.4
LAI_b (m^2 m^2): Leaf area index at first mid-season	4.5
LAI_c (m^2 m^2): Leaf area index at second mid-season	4.5
LAI_d (m^2 m^2): Leaf area index at EGS	3.4
LAI_1(days): Period from LAI_a to LAI_b	30
LAI_2(days): Period from LAI_c to LAI_d	10
SAI (surface area index) calculation	Forest
Phenology function fphen	
fphen_a: fphen at SGS	1.0
fphen_b: fphen at mid-season	1.0
fphen_c: fphen at second mid-season	1.0
fphen_d: fphen at third mid-season	1.0
fphen_e: fphen at EGS	1.0
fphen_1 (days): Period from fphen_a to fphen_b	0
fphen_limA (day of year): Start of SWP limitation	0
fphen_2 (days): Period from fphen_b to fphen_c	0
Fphen 3 (days): Period from fphen_c to fphen_d	0
fphen_limB (day of year): End of SWP limitation	0
fphen_4 (days) (days): Period from fphen_d to fphen_e	0
Leaf fphen calculation	Same as fphen