

## Supplementary Information to

# Phytotoxic ozone dose and the role of environmental factors in ozone uptake of dwarf mountain pine

Svetlana Bičárová<sup>1</sup>, Zuzana Sitková<sup>2</sup>, Hana Pavlendová<sup>2</sup>, Peter Fleischer jr.<sup>3</sup>, Peter Fleischer sr.<sup>3</sup>, and Andrzej Bytnerowicz<sup>4</sup>

<sup>1</sup>Institute of Earth Science of the Slovak Academy of Sciences, Stará Lesná, 059 60 Tatranská Lomnica, Slovakia

<sup>2</sup>National Forest Centre–Forest Research Institute Zvolen, T. G. Masaryka 22, 960 92 Zvolen, Slovakia

<sup>3</sup>Technical University in Zvolen, T. G. Masaryka 24, 960 92 Zvolen, Slovakia

<sup>4</sup>USDA Forest Service, Pacific Southwest Research Station, 4955 Canyon Crest Drive, Riverside, CA 92507, USA

Correspondence to: Svetlana Bičárová ([bicarova@ta3.sk](mailto:bicarova@ta3.sk))

(Supporting Information includes 2 pages, 1 table)

### Part SI-1: Details to section: Methods DO<sub>3</sub>SE model parameterization for version (DO<sub>3</sub>SE\_INTv3.0.5)

The interface of DO<sub>3</sub>SE 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 Mountain pine;  
G<sub>max</sub> built-in preset adjusted from 160 to \*110 mmol O<sub>3</sub> m<sup>-2</sup> PLA s<sup>-1</sup> according to field measurement in SK–HT

| Input data  |                       |
|---|-----------------------|
| O <sub>3</sub> _zR (ppb): Measured O <sub>3</sub> concentration   | hourly variables      |
| Ts (°C): Air temperature  | hourly variables      |
| VPD (kPa): Vapour Pressure Deficit  | hourly variables      |
| Uh_zR (m s <sup>-1</sup> ): Wind speed  | hourly variables      |
| Precip (mm): Precipitation  | hourly variables      |
| P (kPa): Pressure   | hourly variables      |
| R (Wh m <sup>-2</sup> ): Global radiation   | hourly variables      |
| Measurement data  |                       |
| O <sub>3</sub> measurement height (m), recalculated   | 20                    |
| O <sub>3</sub> 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 <sup>-1</sup> ): Soil resistance to the vertical soil water distribution   | 200                   |
| Vegetation characteristics  |                       |
| H (m): Canopy height  | 2                     |
| Root (m): Root depth  | 0.5                   |
| Lm (m): Cross-wind leaf dimension   | 0.008                 |
| Albedo (fraction)   | 0.12                  |
| G <sub>max</sub> (mmol O <sub>3</sub> m <sup>-2</sup> PLA s <sup>-1</sup> ): Maximum stomatal conductance to O <sub>3</sub> | (160)*110             |
| Sun/shade factor (fraction)   | 1.00                  |

|  |  |
|--|--|
| $f_{\min}$ (fraction): Minimum stomatal conductance to $O_3$   | 0.10                                   |
| $R_{\text{ext}}$ ( $s\ m^{-1}$ ): External plant cuticle resistance  | 2500                                   |
| Threshold Y for $POD_y$ ( $nmol\ m^{-2}\ s^{-1}$ )   | 1.00                                   |
| $G_{\text{sto}0}$ ( $\mu mol\ m^{-2}\ s^{-1}$ ): Closed stomata conductance  | 30,000                                 |
| m (dimensionless): Species-specific sensitivity to An  | 16.83                                  |
| $V_{\text{cmax}}$ ( $\mu mol\ m^{-2}\ s^{-1}$ ): Maximum catalytic rate at 25°C  | 30.00                                  |
| $J_{\text{cmax}}$ ( $\mu mol\ m^{-2}\ s^{-1}$ ): Maximum rate of electron transport at 25°C                                      | 60.00                                  |
| <b>Environmental response</b>  |  |
| $light_a$ (dimensionless): Species-specific parameter for response $G_{\text{sto}}$ to photosynthetic photon flux density (PPFD) | 0.008                                  |
| $T_{\min}$ (°C): Minimum temperature for $G_{\text{sto}}$  | 1                                      |
| $T_{\text{opt}}$ (°C): Optimum temperature for $G_{\text{sto}}$  | 18                                     |
| $T_{\max}$ (°C): Maximum temperature for $G_{\text{sto}}$  | 36                                     |
| $VPD_{\min}$ (kPa): Vapour pressure deficit for min. $G_{\text{sto}}$  | 3.3                                    |
| $VPD_{\max}$ (kPa): Vapour pressure deficit for max. $G_{\text{sto}}$  | 0.6                                    |
| $SWP_{\min}$ (MPa): Soil water potential for min. $G_{\text{sto}}$   | -1.20                                  |
| $SWP_{\max}$ (MPa): Soil water potential for max. $G_{\text{sto}}$   | -0.76                                  |
| <b>Model options</b>   |  |
| Stomatal conductance model   | Multiplicative                         |
| Leaf temperature calculation   | Estimate                               |
| $fO_3$ calculation   | Not used ( $fO_3=1$ )                  |
| Soil water influence on $G_{\text{sto}}$   | Use fSWP                               |
| LWP calculation  | Steady-state (SS)                      |
| fSWP calculation   | Linear ( $SWP_{\min}$ , $SWP_{\max}$ ) |
| <b>Season</b>  | 1 April–30 September 2016              |
| SGS: Start of growing season   | 1                                      |
| EGS: End of growing season   | 365                                    |
| $LAI_a$ ( $m^2\ m^{-2}$ ): 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 $LAI_b$   | 192                                    |
| $LAI_2$ (days): Period from $LAI_c$ to $LAI_d$   | 96                                     |
| SAI (surface area index) calculation   | Forest                                 |
| <b>Phenology function fphen</b>  |  |
| 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): Period from fphen_d to fphen_e   | 0                                      |
| <b>Leaf fphen calculation</b>  | Same as fphen                          |