



Supplement of

Simulating *Ips typographus* L. outbreak dynamics and their influence on carbon balance estimates with ORCHIDEE r8627

Guillaume Marie et al.

Correspondence to: Guillaume Marie (guillaume.marie@lsce.ipsl.fr), Jina Jeong (j.jeong@vu.nl), and Sebastiaan Luysaert (s.luyssaert@vu.nl)

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Supplementary material:

Table S1: the 36 parameter sets used to access the sensitivity of four main equations driving the *ips typographus* outbreak model. Italicized numbers are reference values whereas regular numbers correspond to the sensitivity analysis described in section 3.3. The underlined parameter corresponds to the chosen parameter values for which the credibility score =4 and the parameters set in bold is the one chosen for this study.

<i>i</i> _{beetles generation}									
	<i>S</i> _{generation}	<i>G</i> _{limit}	<i>S</i> _{activity}	<i>act</i> _{limit}	<i>S</i> _{susceptibility}	<i>i</i> _{rd susceptibility}	<i>S</i> _{mass attack}	<i>BP</i> _{limit}	Score
Set 1.1	<u>1.0</u>	<u>0.5</u>	-20.0	0.06	-5.0	0.55	-30.0	0.12	4
Set 1.2	5.0	0.5	-20.0	0.06	-5.0	0.55	-30.0	0.12	2
Set 1.3	500.0	0.5	-20.0	0.06	-5.0	0.55	-30.0	0.12	2
Set 1.4	<u>1.0</u>	<u>1.0</u>	-20.0	0.06	-5.0	0.55	-30.0	0.12	4
Set 1.5	<u>5.0</u>	<u>1.0</u>	-20.0	0.06	-5.0	0.55	-30.0	0.12	4
Set 1.6	500.0	1.0	-20.0	0.06	-5.0	0.55	-30.0	0.12	2
Set 1.7	1.0	1.5	-20.0	0.06	-5.0	0.55	-30.0	0.12	3
Set 1.8	5.0	1.5	-20.0	0.06	-5.0	0.55	-30.0	0.12	0
Set 1.9	500.0	1.5	-20.0	0.06	-5.0	0.55	-30.0	0.12	0
<i>i</i> _{beetles activity}									
	<i>S</i> _{generation}	<i>G</i> _{limit}	<i>S</i> _{activity}	<i>act</i> _{limit}	<i>S</i> _{susceptibility}	<i>i</i> _{rd susceptibility}	<i>S</i> _{mass attack}	<i>BP</i> _{limit}	Score
Set 2.1	1.0	1.0	-1.0	0.03	-5.0	0.55	-30.0	0.12	0
Set 2.2	1.0	1.0	-20.0	0.03	-5.0	0.55	-30.0	0.12	0
Set 2.3	1.0	1.0	-500.0	0.03	-5.0	0.55	-30.0	0.12	3
Set 2.4	1.0	1.0	-1.0	0.06	-5.0	0.55	-30.0	0.12	0
Set 2.5	1.0	1.0	-20.0	0.06	-5.0	0.55	-30.0	0.12	2
Set 2.6	1.0	1.0	<u>-500.0</u>	<u>0.06</u>	-5.0	0.55	-30.0	0.12	4
Set 2.7	1.0	1.0	-1.0	0.09	-5.0	0.55	-30.0	0.12	0
Set 2.8	1.0	1.0	-20	0.09	-5.0	0.55	-30.0	0.12	0
Set 2.9	1.0	1.0	-500	0.09	-5.0	0.55	-30.0	0.12	2
<i>i</i> _{hosts susceptibility}									
	<i>S</i> _{generation}	<i>G</i> _{limit}	<i>S</i> _{activity}	<i>act</i> _{limit}	<i>S</i> _{susceptibility}	<i>i</i> _{rd susceptibility}	<i>S</i> _{mass attack}	<i>BP</i> _{limit}	Score
Set 3.1	1.0	1.0	-20.0	0.06	-1.0	0.275	-30.0	0.12	0
Set 3.2	1.0	1.0	-20.0	0.06	-5.0	0.275	-30.0	0.12	1
Set 3.3	1.0	1.0	-20.0	0.06	-500.0	0.275	-30.0	0.12	1
Set 3.4	1.0	1.0	-20.0	0.06	-1.0	0.55	-30.0	0.12	0
Set 3.5	1.0	1.0	-20.0	0.06	<u>-5.0</u>	<u>0.55</u>	-30.0	0.12	4
Set 3.6	1.0	1.0	-20.0	0.06	-500.0	0.55	-30.0	0.12	2
Set 3.7	1.0	1.0	-20.0	0.06	-1.0	0.825	-30.0	0.12	0
Set 3.8	1.0	1.0	-20.0	0.06	-5.0	0.825	-30.0	0.12	2
Set 3.9	1.0	1.0	-20.0	0.06	-500.0	0.825	-30.0	0.12	2
<i>i</i> _{beetles mass attack}									
	<i>S</i> _{generation}	<i>G</i> _{limit}	<i>S</i> _{activity}	<i>act</i> _{limit}	<i>S</i> _{susceptibility}	<i>i</i> _{rd susceptibility}	<i>S</i> _{mass attack}	<i>BP</i> _{limit}	Score
Set 4.1	1.0	1.0	-20.0	0.06	-5.0	0.55	-1.0	0.06	0
Set 4.2	1.0	1.0	-20.0	0.06	-5.0	0.55	-30.0	0.06	0
Set 4.3	1.0	1.0	-20.0	0.06	-5.0	0.55	-500.0	0.06	3
Set 4.4	1.0	1.0	-20.0	0.06	-5.0	0.55	-1.0	0.12	0
Set 4.5	1.0	1.0	-20.0	0.06	-5.0	0.55	<u>-30.0</u>	<u>0.12</u>	4

Set 4.6	1.0	1.0	-20.0	0.06	-5.0	0.55	<u>-500.0</u>	<u>0.12</u>	4
Set 4.7	1.0	1.0	-20.0	0.06	-5.0	0.55	-1.0	0.18	2
Set 4.8	1.0	1.0	-20.0	0.06	-5.0	0.55	-30.0	0.18	3
Set 4.9	1.0	1.0	-20.0	0.06	-5.0	0.55	<u>-500.0</u>	<u>0.18</u>	4

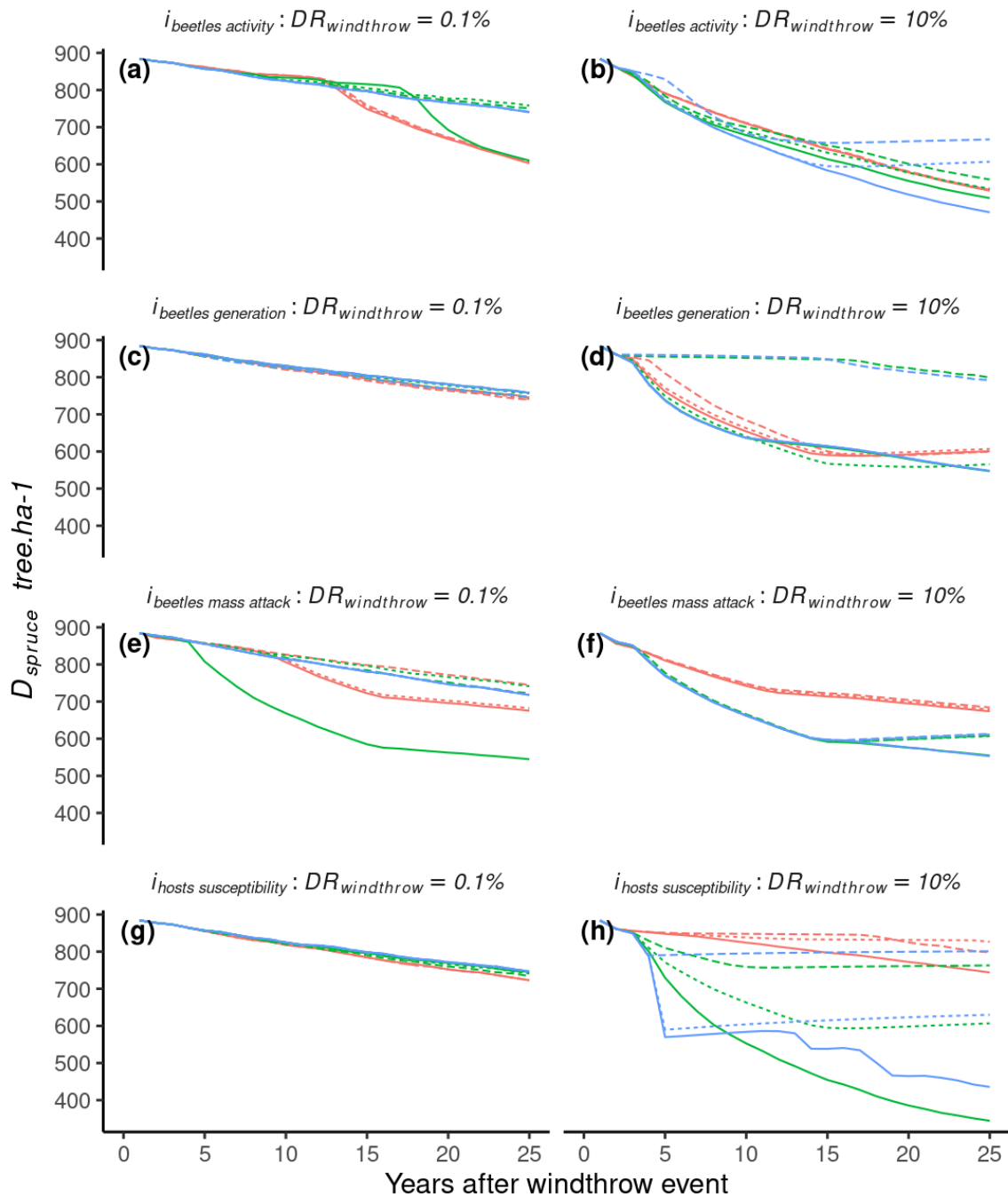


Figure S1: Simulation results of tree stand density D_{spruce} from the sensitivity experiment at the THA site. Eight parameters from four equations were evaluated. Each equation represents an index from the bark beetle outbreak model ($i_{hosts\ susceptibility}$, $i_{hosts\ mass\ attack}$, $i_{beetles\ activity}$, $i_{beetles\ generation}$). Each index is represented by a logistic function defined by a shape parameter ($Shape$) and a limit parameter ($Limit$). Three values were chosen for each parameter resulting in 9 pairs of parameters for each index. Colored lines represent the shape parameter varying from linear : $Shape = -1.0$ (red), logistic $-5.0 < Shape < -30.0$ (green), to step function where $Shape = -500.0$ (blue). Line type represents three different values for $Limit$ parameters where references (dashed line) are values of $i_{rd\ susceptibility}$, BP_{lim} , act_{lim} and G_{lim} (given in table 4), whereas permissive (full line) and restrictive (dashed dotted) represent a 50% decrease or increase respectively.

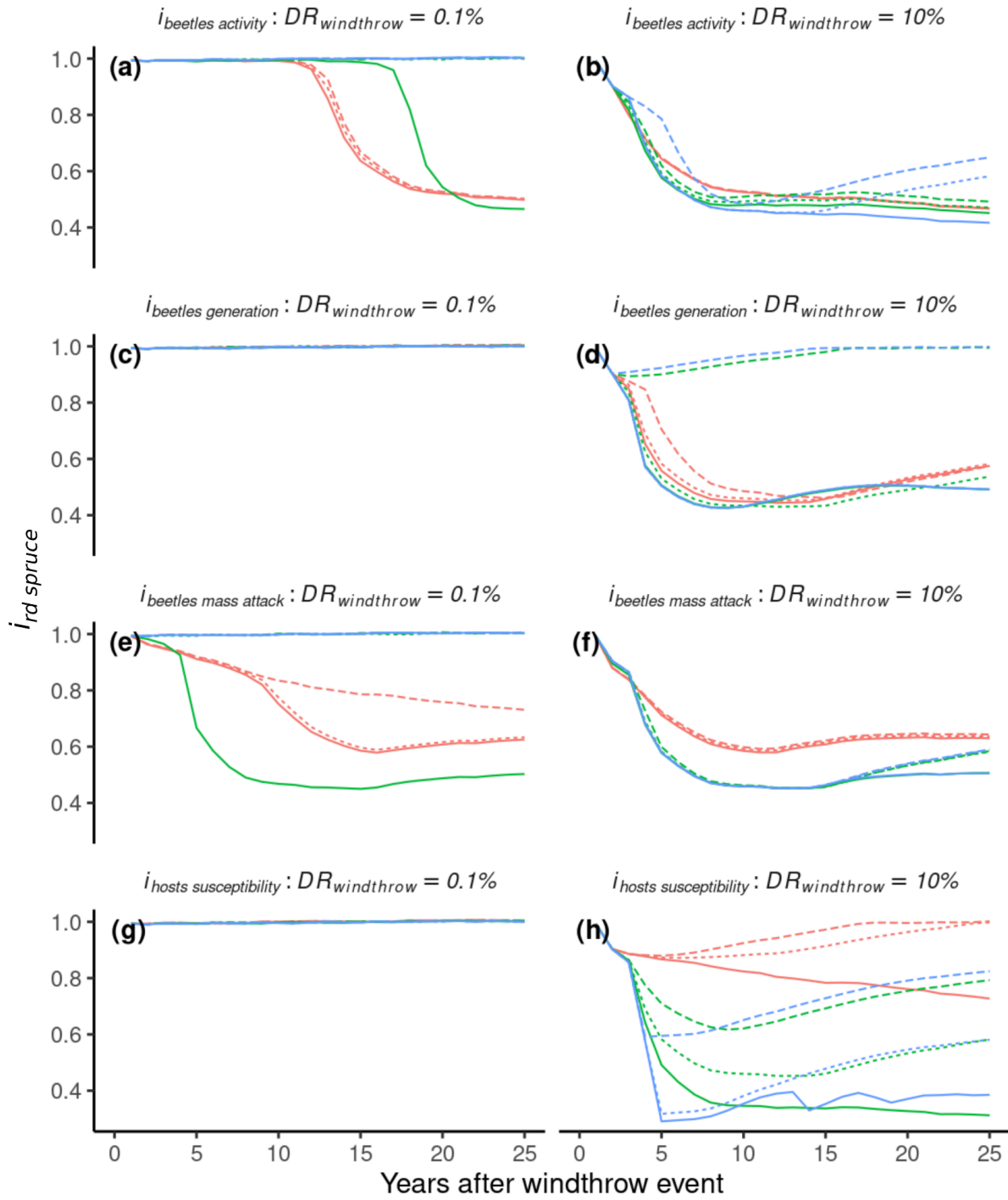


Figure S2: same caption as for S2 but showing the result of the relative spruce stand density index $i_{rd\ spruce}$.

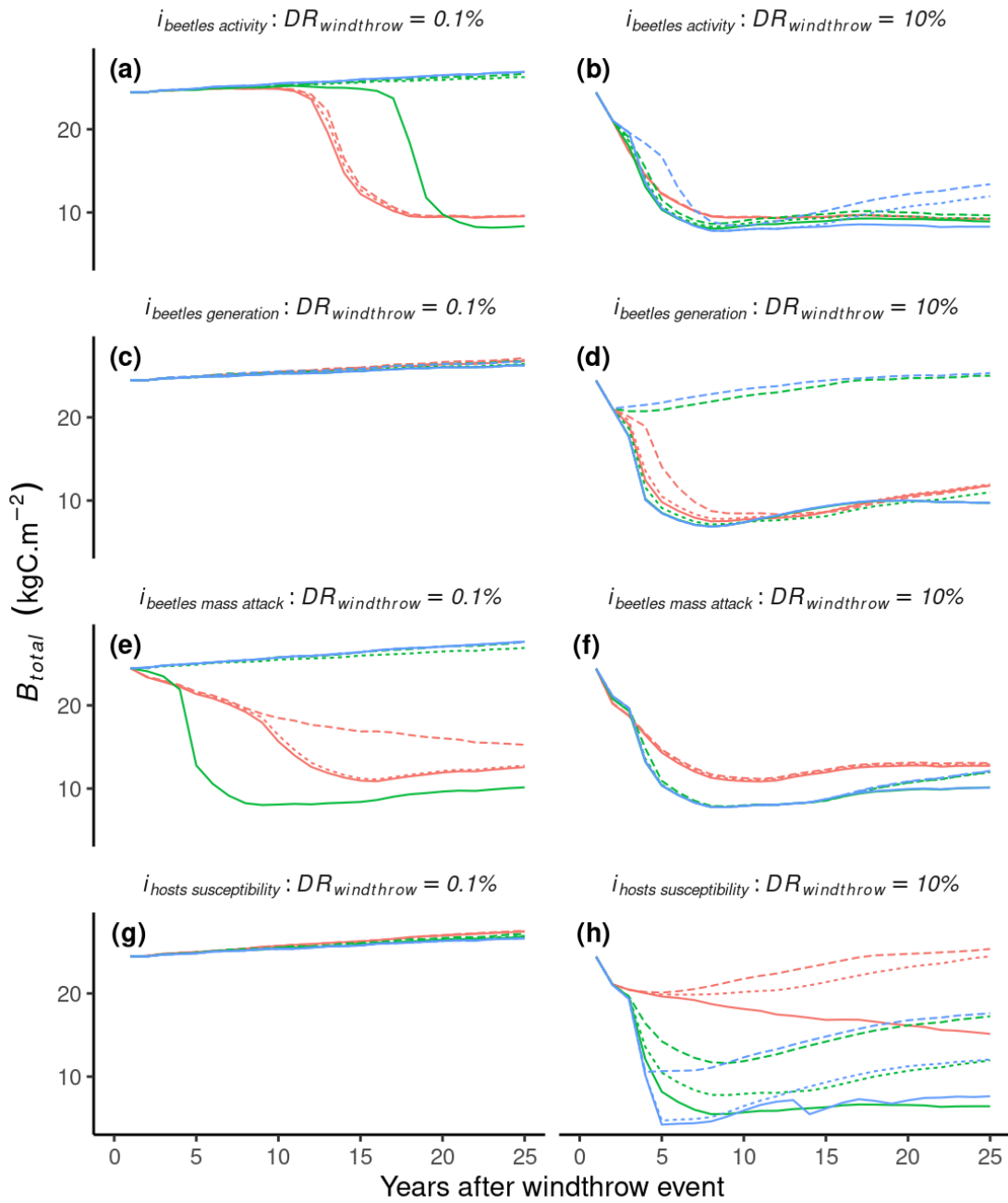


Figure S3: same caption as for S2 but showing the result of the total stand biomass B_{total} .