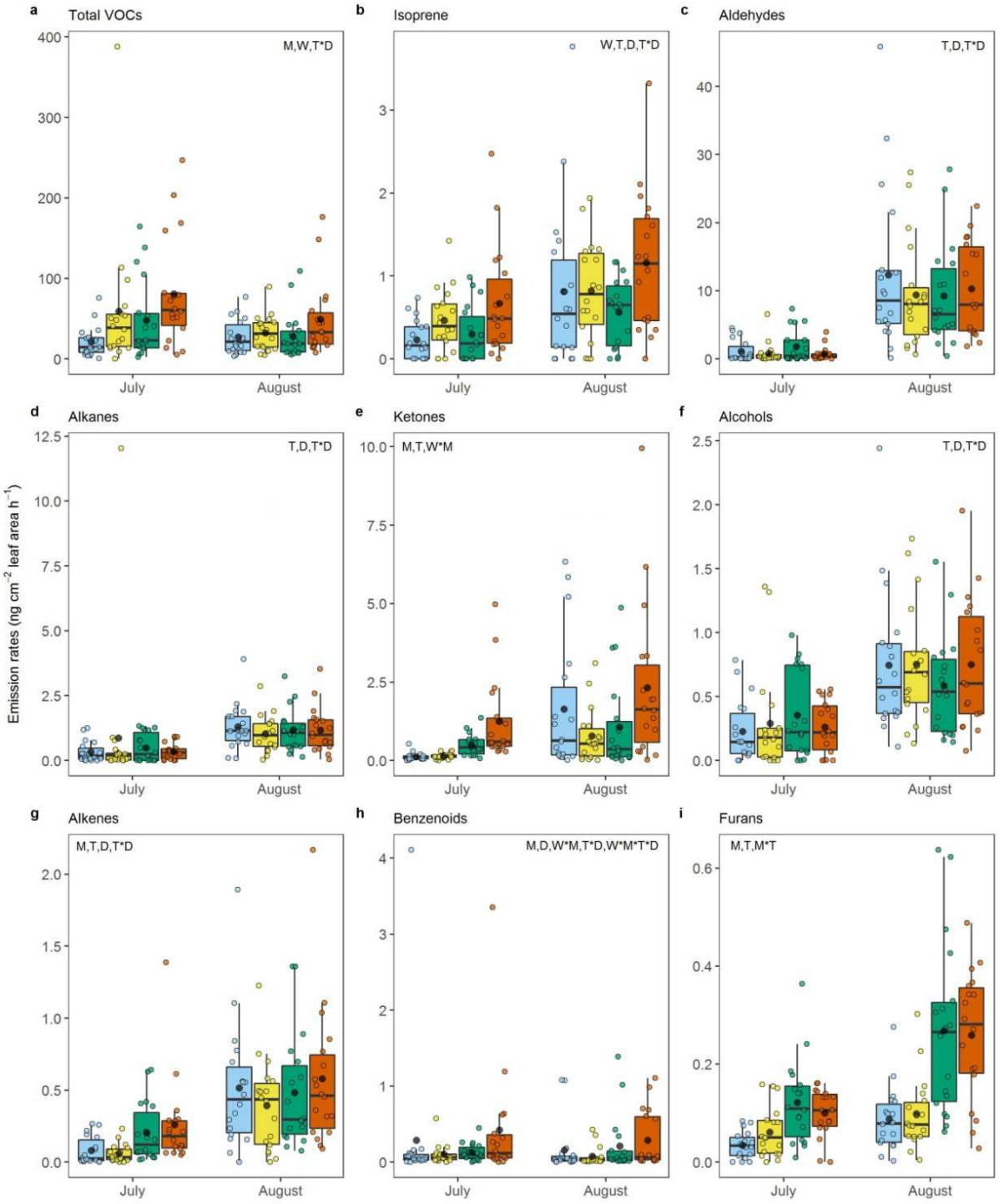
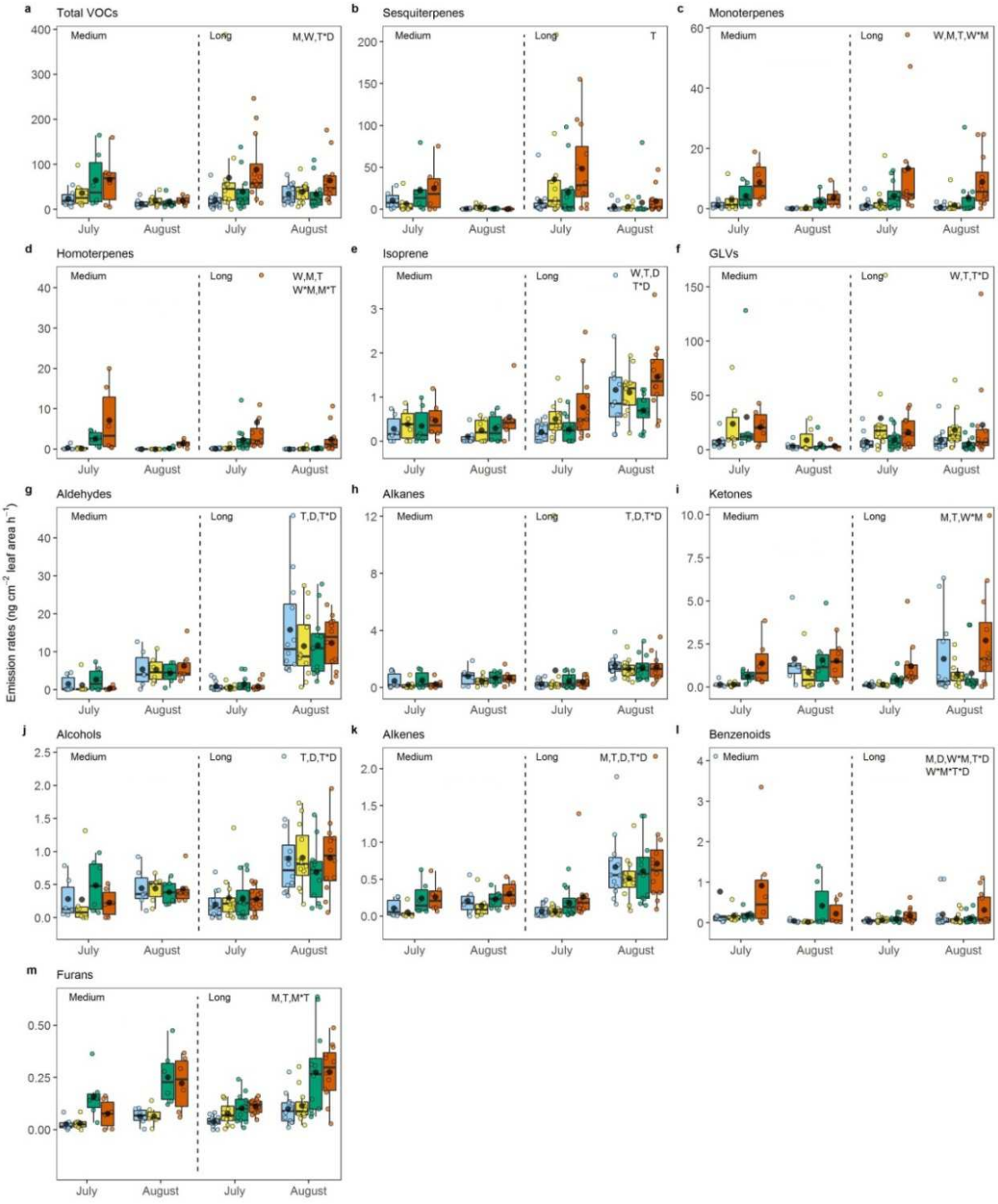
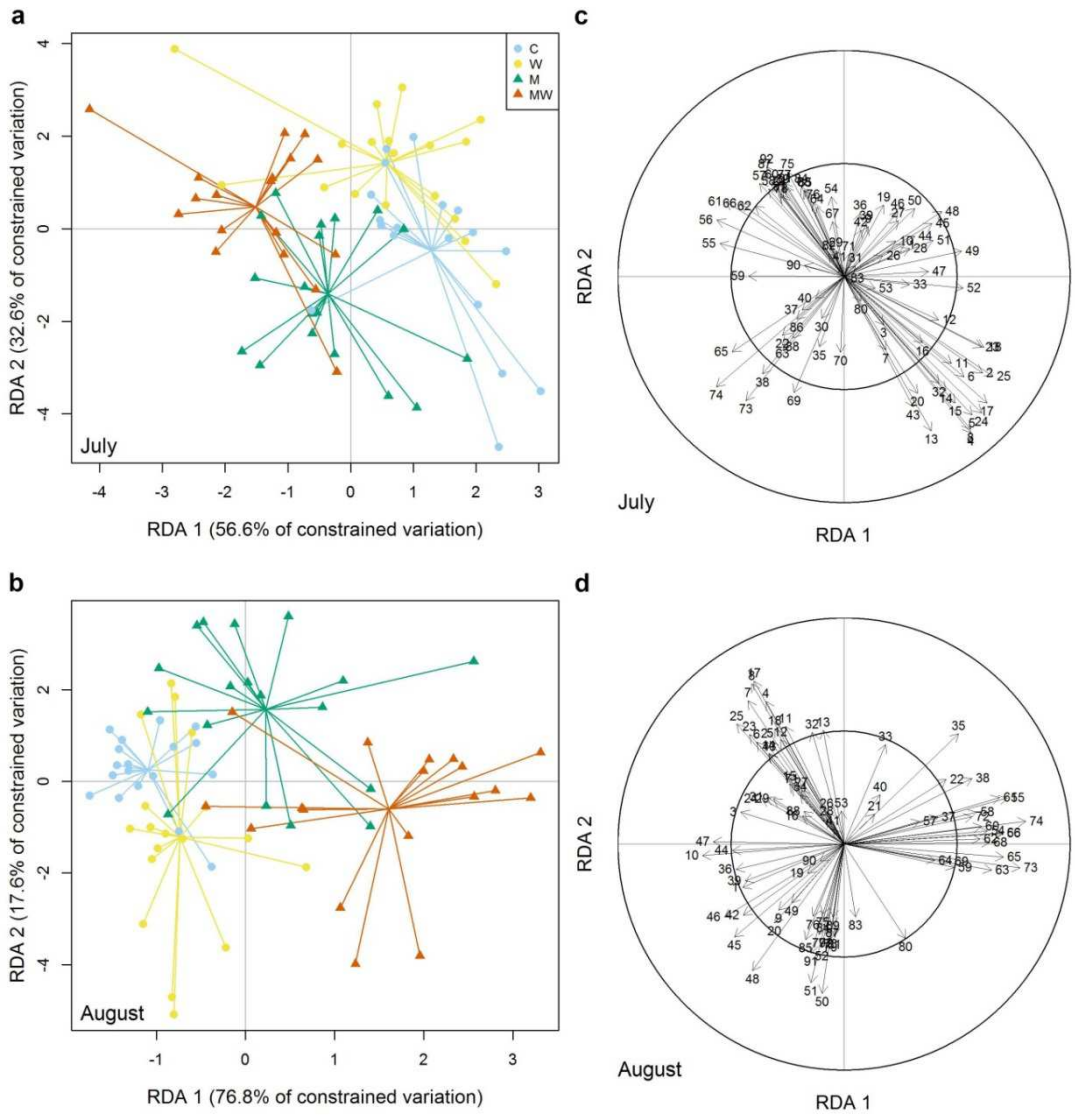


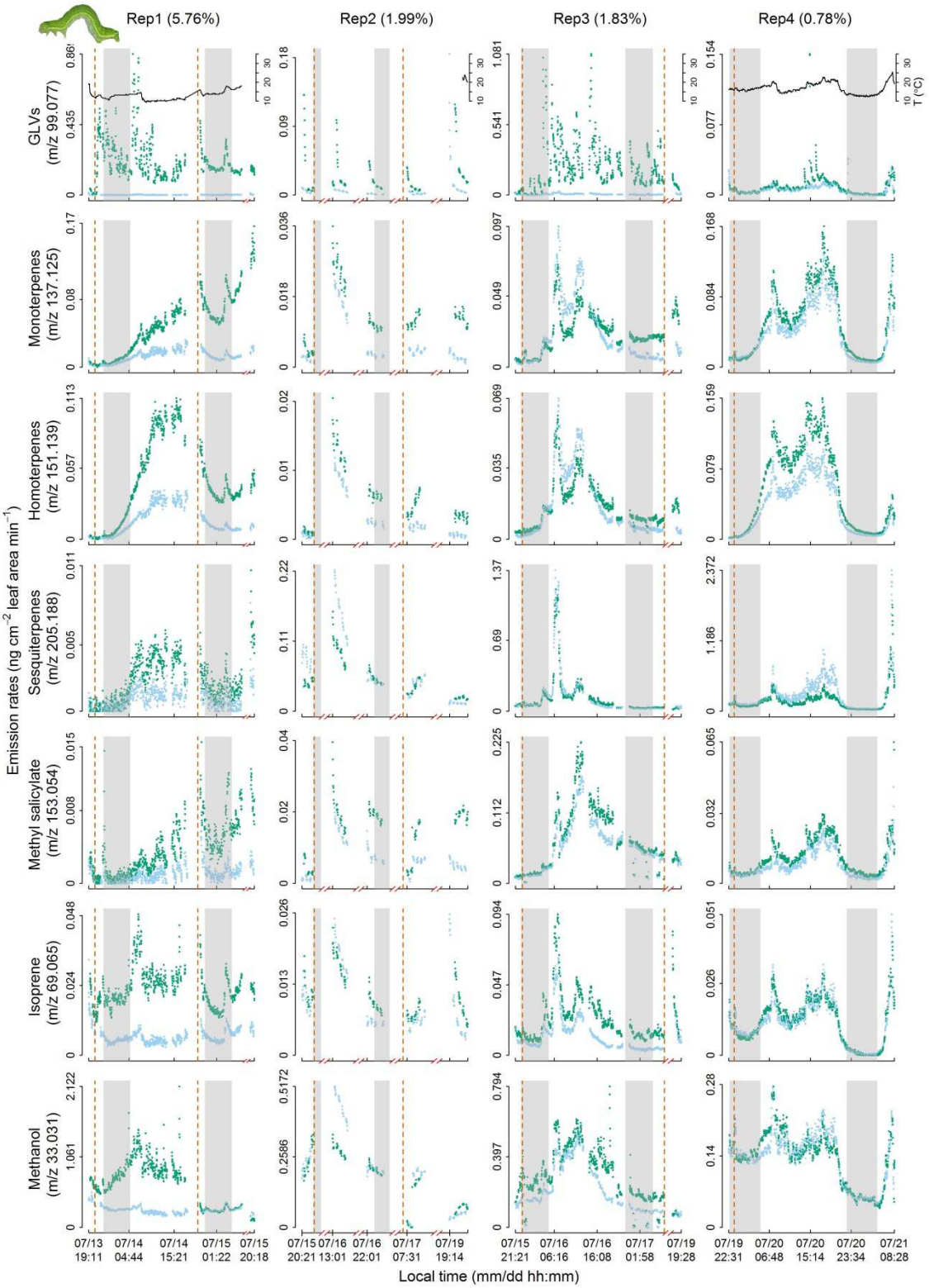
Supplementary Fig. 1 Impacts of *in situ* warming and mimicked herbivory on VOC emissions. Each coloured dot represents a single experimental plant; the box and whisker plots show the median, the 25th and 75th percentiles (boxes) and the 10th and 90th percentiles (error bars), with the mean shown with a black dot (n = 18). Colours indicate different treatments [light blue: control; yellow: warming (W); dark green: methyl jasmonate (M); orange: combination of warming and methyl jasmonate]. Capital letters indicate significant effects of the corresponding treatments (Supplementary Tables 2 and 3), where D and T represent warming duration and sampling time, respectively.



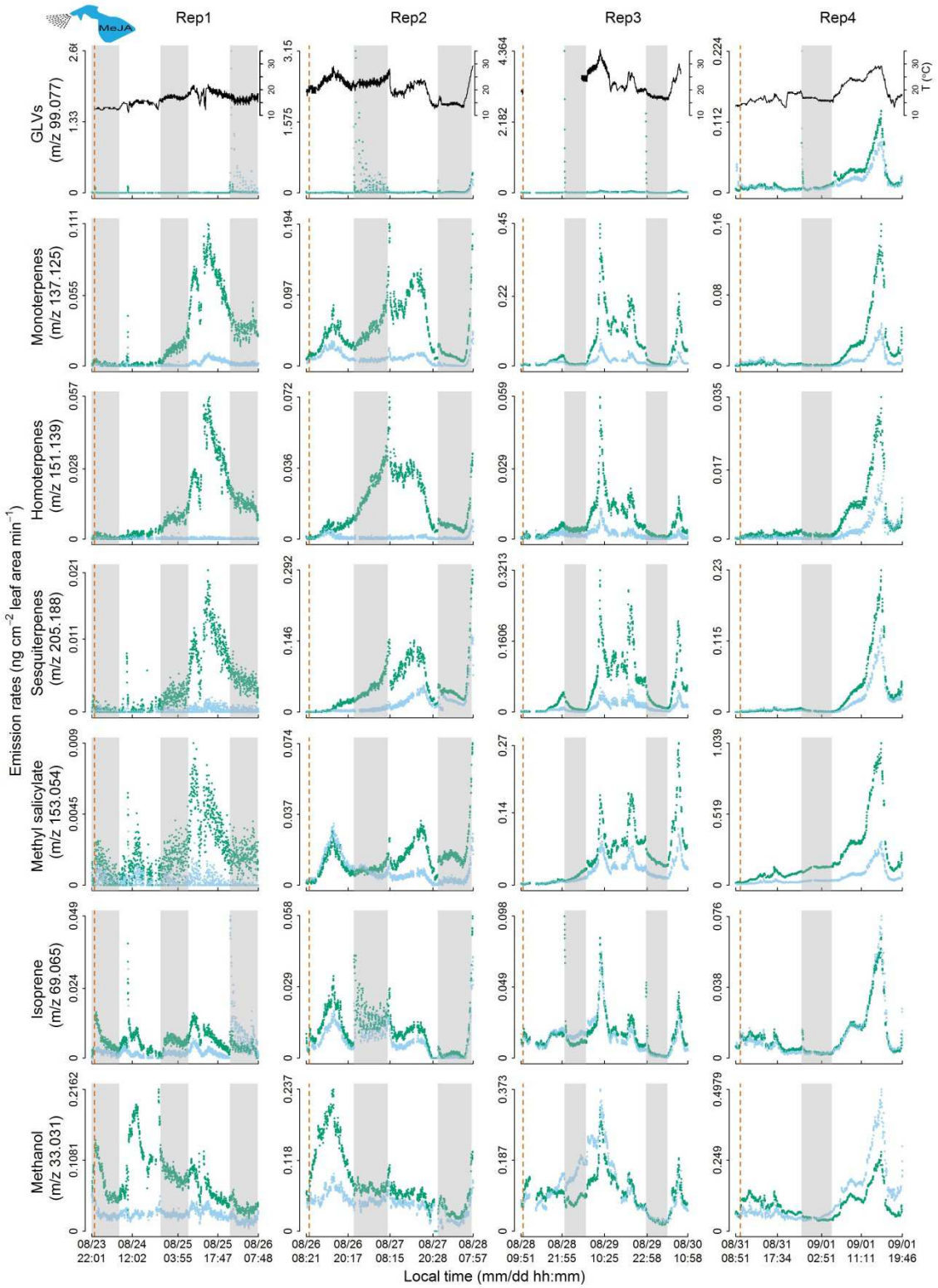
Supplementary Fig. 2 Impacts of warming duration and mimicked herbivory on VOC emissions. Each coloured dot represent a single experimental plant; the box and whisker plots show the median, the 25th and 75th percentiles (boxes) and the 10th and 90th percentiles (error bars), with the mean shown with a black dot. Colours indicate different treatments [light blue: control; yellow: warming (W); dark green: methyl jasmonate (M); orange: combination of warming and methyl jasmonate]. Capital letters indicate significant effects of the corresponding treatments (Supplementary Table 2), where D and T represent warming duration and sampling time, respectively. Medium and Long refers to warming duration of 8 and 18 years, respectively. n=6 and 12 under medium- and long-term warming, respectively.



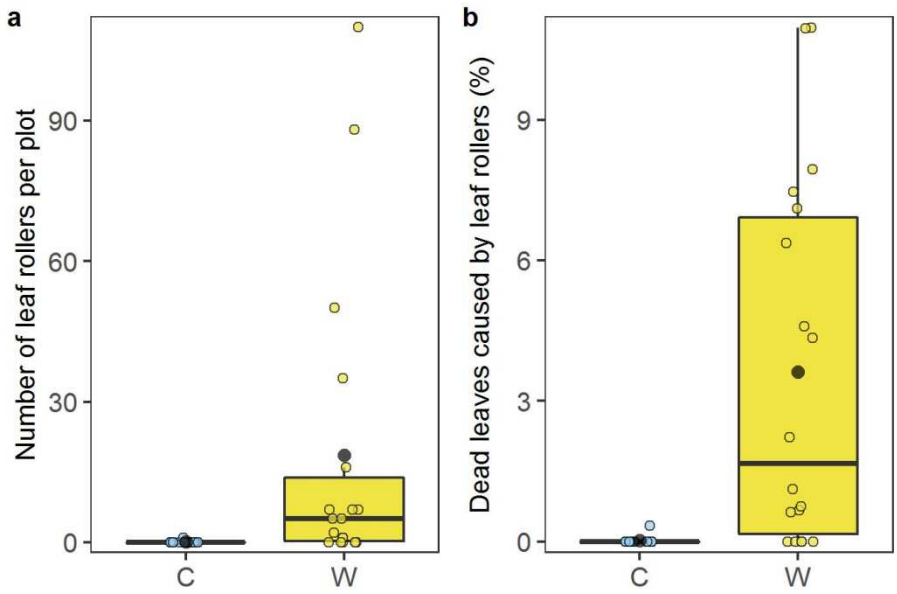
Supplementary Fig. 3 Impacts of warming and mimicked herbivory on VOC blend composition. Scores (**a**, **b**) and loadings (**c**, **d**) plots of constrained redundancy analysis (RDA) were based on the percentages of 92 individual compounds of the entire VOC blend in July (**a**, **c**) and August (**b**, **d**). The scores plots show the ordination of the samples according to the first two RDA components between different treatments [light blue: control; yellow: warming (W); dark green: methyl jasmonate (M); orange: combination of methyl jasmonate and warming (MW)]. Explained variance by first and second components is given in brackets. The loadings plots show the contribution of each VOC to the discrimination between treatments using the first two RDA components. Compounds are coded according to Supplementary Table 1.



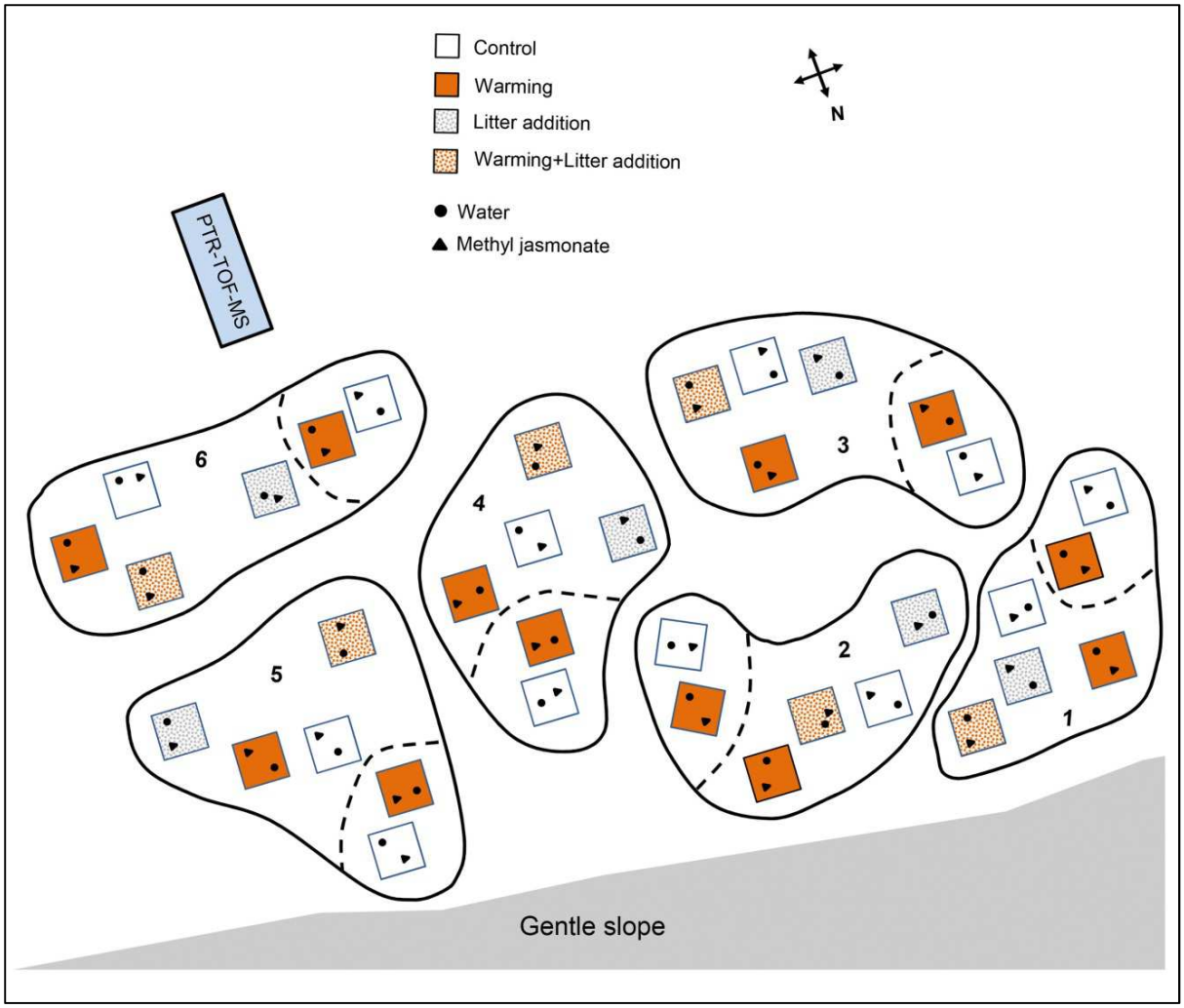
Supplementary Fig. 4 Temporal dynamics of VOC emissions induced after insect herbivory by *Epirrita autumnata* larvae. VOC emissions from four independent measurements (Reps 1, 2, 3 and 4) on separate plants were monitored in real time using PTR-ToF-MS. Light blue and dark green colours represent control shoots and shoots infested by *Epirrita autumnata* larvae, respectively, with percentages of leaf area consumed by larvae given in brackets. The dashed brown vertical lines depict the start and end time of herbivory treatments, and the grey shaded areas indicate the time period when lights were turned off. Air temperatures (T) inside the shoot enclosures are shown with black lines.



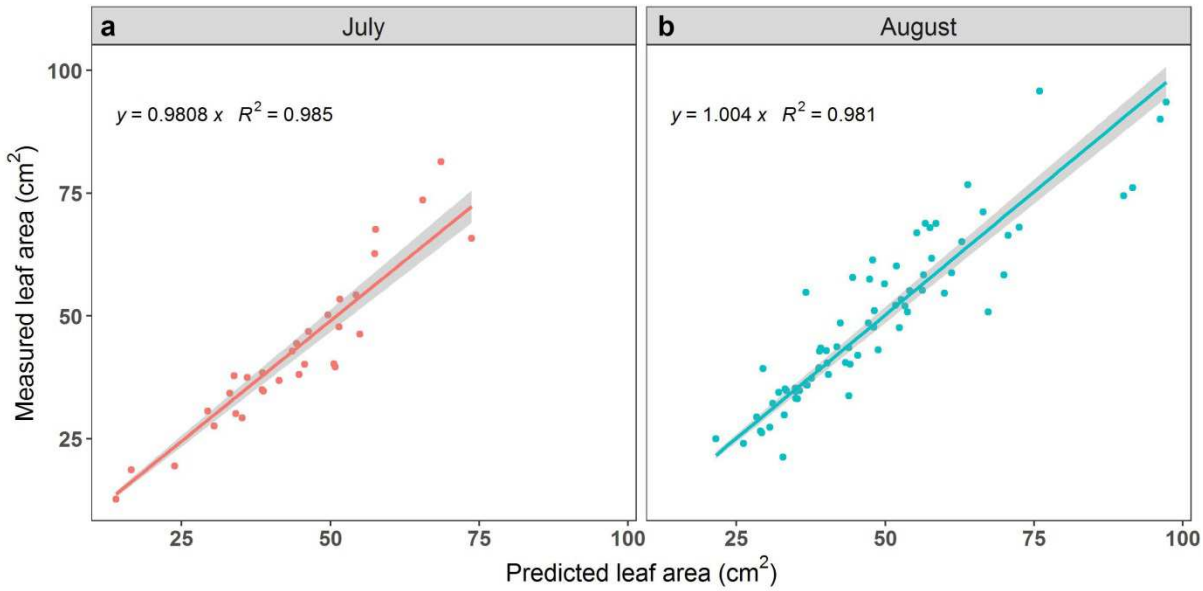
Supplementary Fig. 5 Temporal dynamics of VOC emissions induced upon mimicked herbivory via exogenous application of methyl jasmonate. VOC emissions from four independent measurements (Reps 1, 2, 3 and 4) on separate plants were monitored in real time using PTR-ToF-MS. Light blue and dark green colours represent shoots sprayed with 1.5 ml water and 1mM methyl jasmonate (MeJA), respectively. The dashed brown vertical lines depict the timing of MeJA application, and the grey shaded areas indicate the time period when lights were turned off. Air temperatures (T) inside the shoot enclosures are shown with black lines.



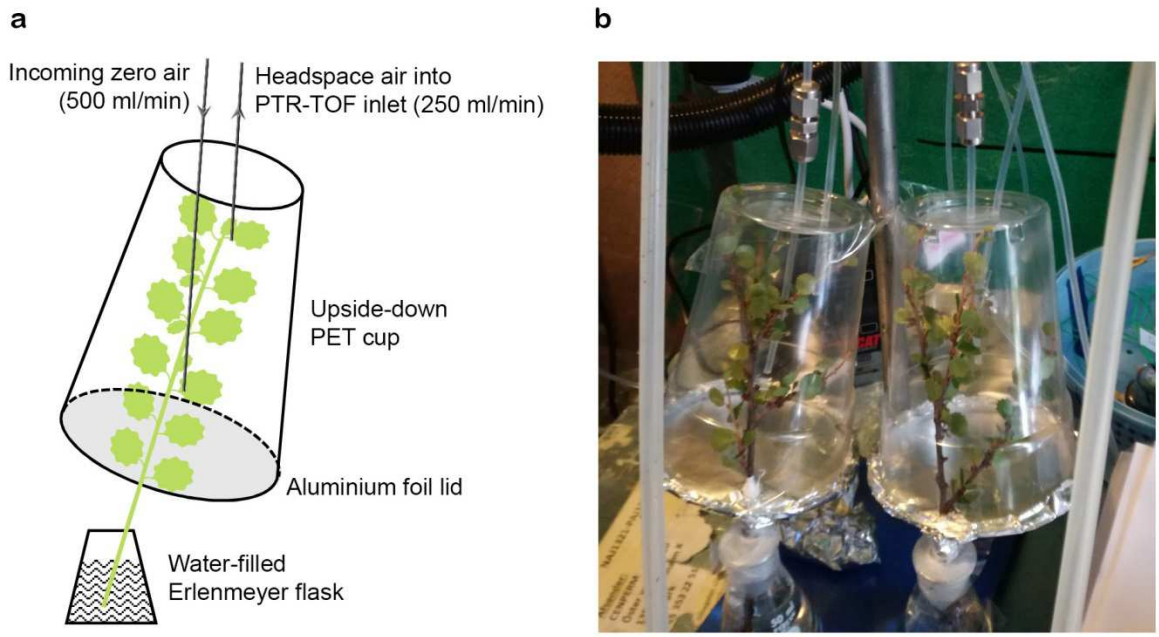
Supplementary Fig. 6 Impacts of *in situ* warming on the abundance of leaf rollers and its damage to leaves. The abundance of leaf rollers was visually estimated as the number of leaf rollers per plot (**a**). Leaf damage caused by them was estimated as the average percentage of dead leaves on three randomly selected *Betula nana* shoots per plot (**b**). Light blue and yellow bars represent control (C) and experimentally warmed (W) plots, respectively. The box and whisker plots show the median, the 25th and 75th percentiles (boxes) and the 10th and 90th percentiles (error bars), with the mean shown with a black dot. The effect of warming was statistically significant for both variables based on linear mixed-effects models (n=18).



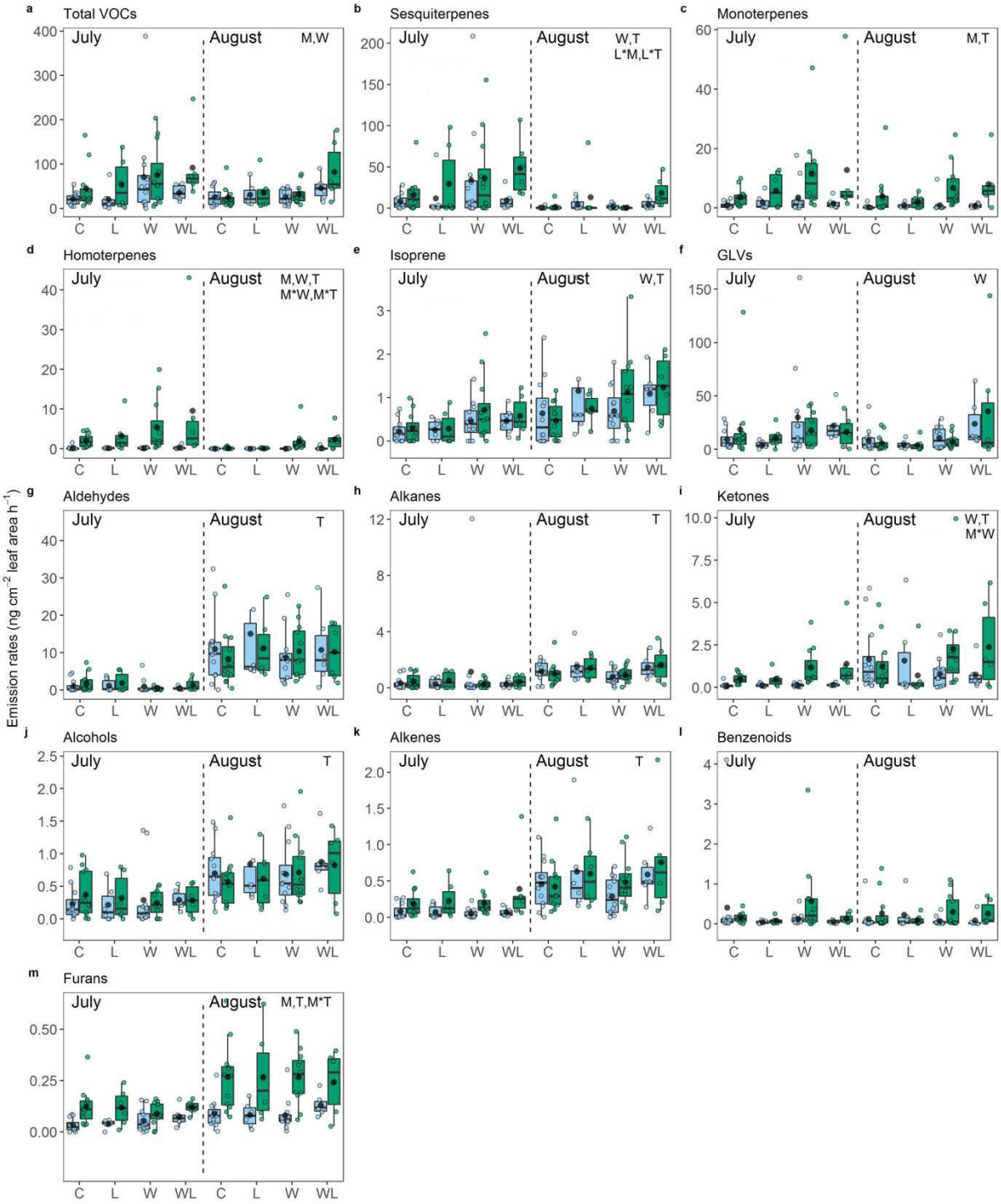
Supplementary Fig. 7 Schematic of the experimental layout. Dashed lines separate the medium-term warming experiments (8 years) from the long-term warming (18 years) experiments with four experimental plots. The triangles and circles represent twigs assigned to methyl jasmonate (MeJA) and control treatments, respectively.



Supplementary Fig. 8 Assessment of the accuracy of visual leaf area estimation. Shown are linear regressions between measured and predicted leaf area in plants collected outside of the experimental plots on July 24 (**a**) and in plants from experimental twigs collected on August 30 (**b**). The shaded area depicts the standard error.



Supplementary Fig. 9 Experimental design for PTR-ToF-MS measurements. Shown are the schematic representation (**a**) and photograph (**b**) of the measurement cuvettes. The outlets of the two cups were directly connected to the inlet of PTR-ToF-MS through an automated three-way valve switching system which alternated between the cups every 10 min. All tubing was made of PTFE and air flow rates were controlled by mass flow controllers.



Supplementary Fig. 10 Effects of warming, litter addition and mimicked herbivory on VOC emissions. Each coloured dot represents a single experimental plant; the box and whisker plots show the median, the 25th and 75th percentiles (boxes) and the 10th and 90th percentiles (error bars), with the mean shown with a black dot (n = 6). Colours indicate mimicked herbivory treatments [light blue: control plants; dark green: plants sprayed with methyl jasmonate (M)]. C: control plots; W: warming plots; L: litter addition plots; WL: plots with both warming and litter addition. The capital letters indicate significant effects of the corresponding treatments (Supplementary Table 6), where T represents the sampling time.