Quantitative relationships between insect herbivory severity and BVOC emissions in a Subarctic mountain birch forest

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Insect herbivory stress

- ~50% of damage caused by biotic factors = **insect herbivores**
- Has increased during recent decades
- Predicted to increase in future
- Major contribution to the total BVOC emission rates during herbivore feeding periods

BVOC emissions

Insect herbivory

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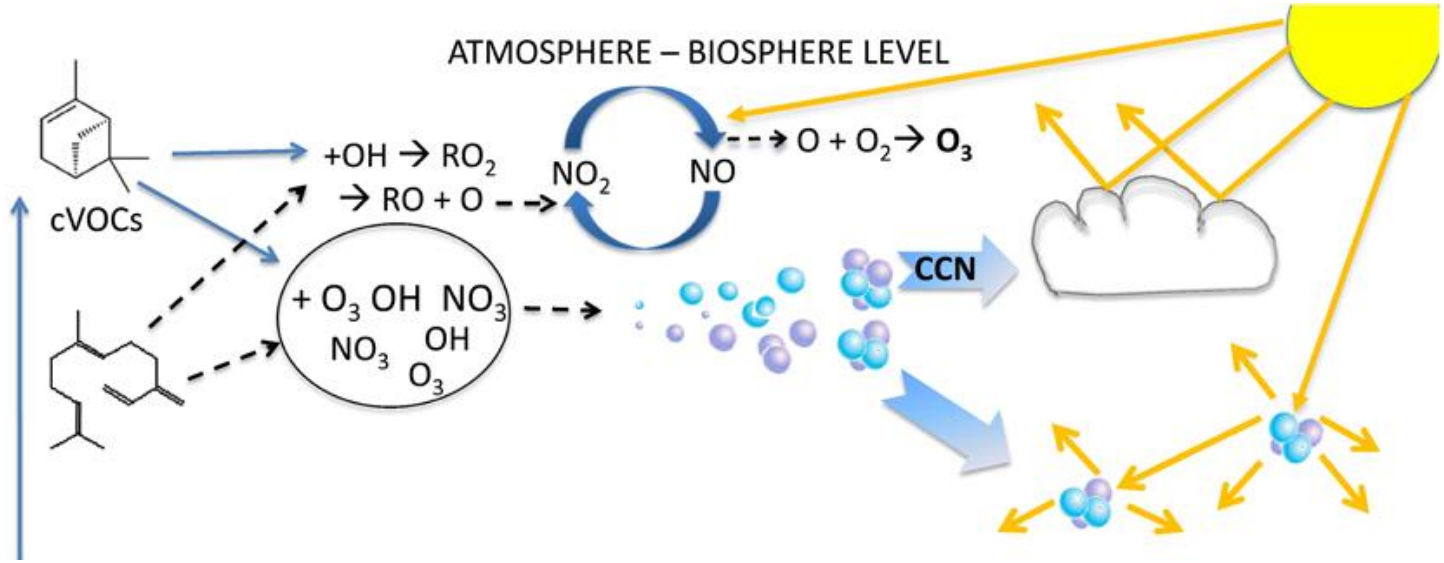
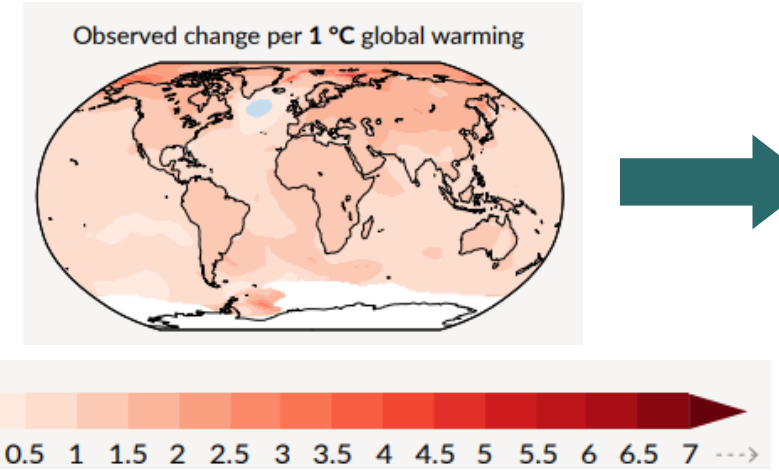
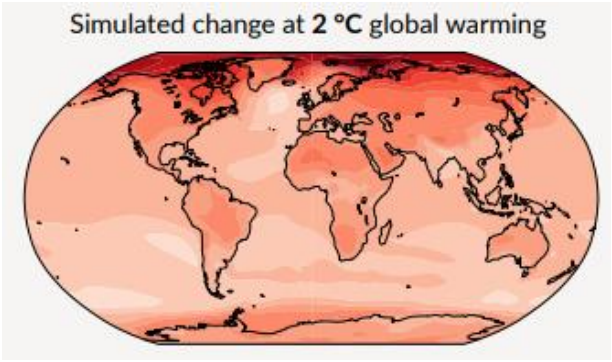
global BVOC models



Holopainen & Blande (2013)

BVOCs and insect herbivory in the Arctic





IPCC, 2021

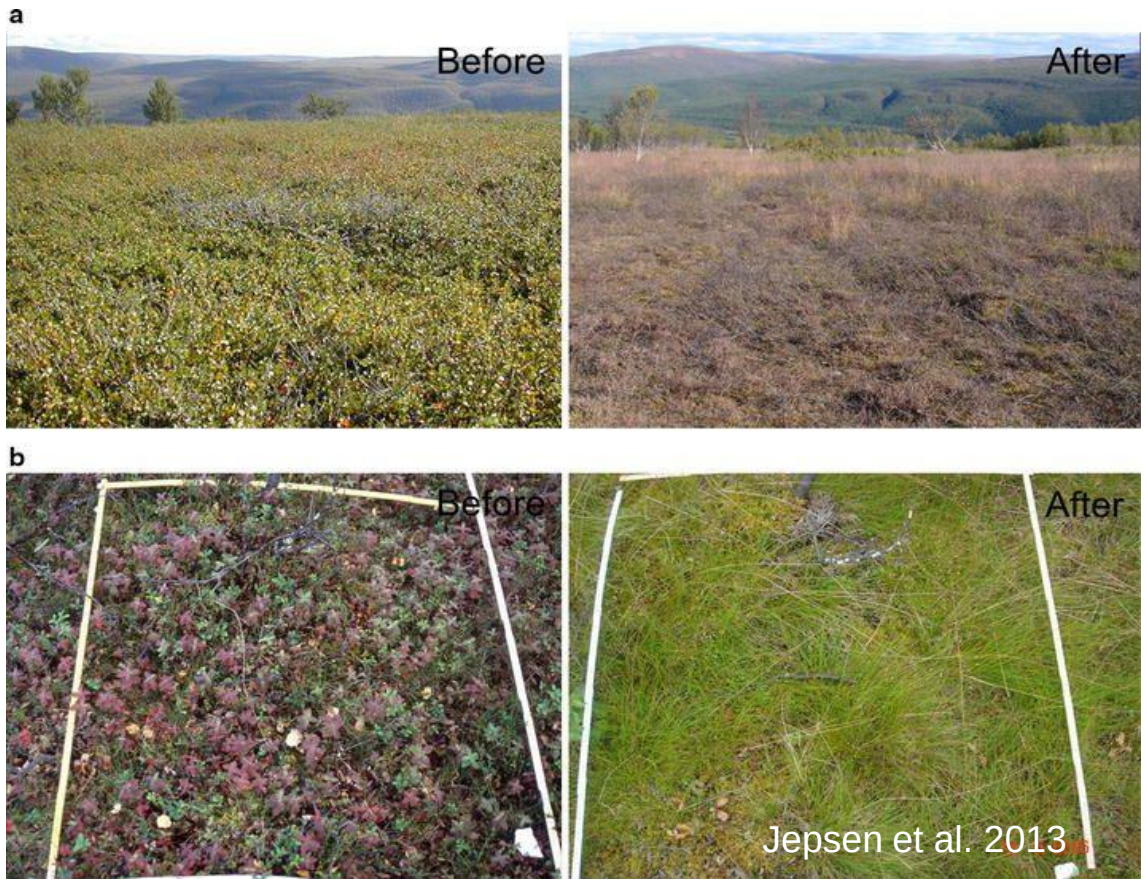
BVOC emissions

Li et al. 2019 *Nature Plants*
Rieksta et al. *2020 Frontiers in Plant Science*
Rieksta et al. 2021 *Global Change Biology*

Higher insect herbivore pressure

New pests moving higher up altitudes, latitudes

Insect herbivory in the Arctic



Study sites

Aim: assess how quantitative and qualitative BVOC emissions change with increasing insect feeding intensity.

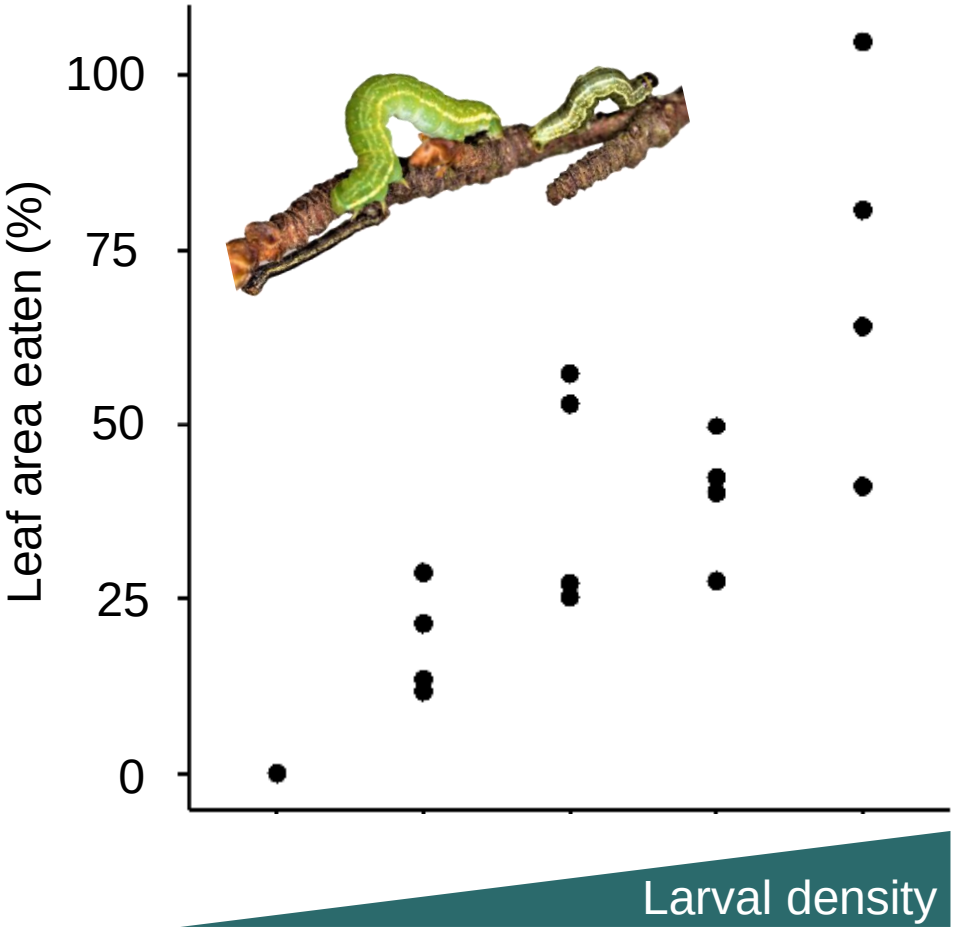
Mountain birch (*Betula pubescens* var. *pumila*)

Experimental design

Winter moth (*Operophtera brumata)*
Autumnal moth *(Epirrita autumnata)*

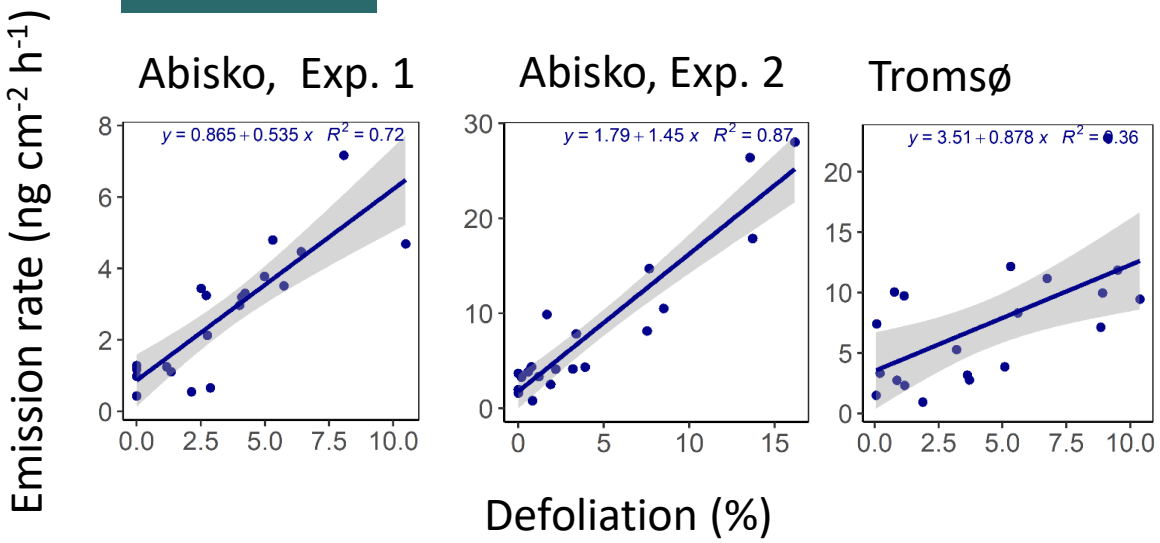
Different larval densities applied to obtain variation in leaf area eaten

Mix of winter and autumnal moth larvae

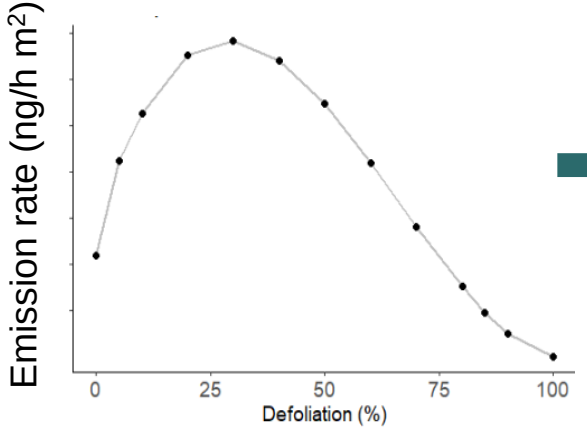


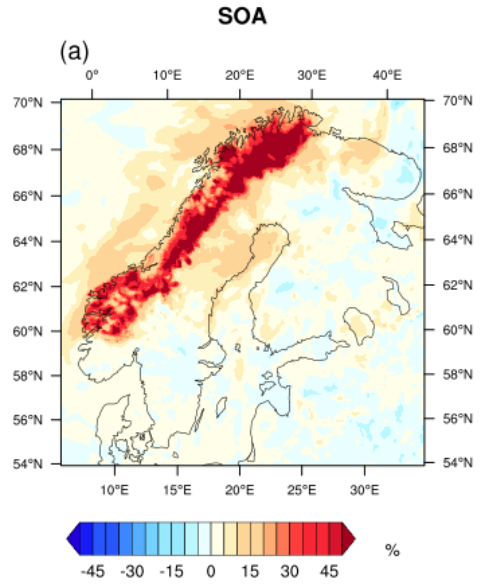
Change in the emission rate in response to increasing defoliation

Observed



Modelled





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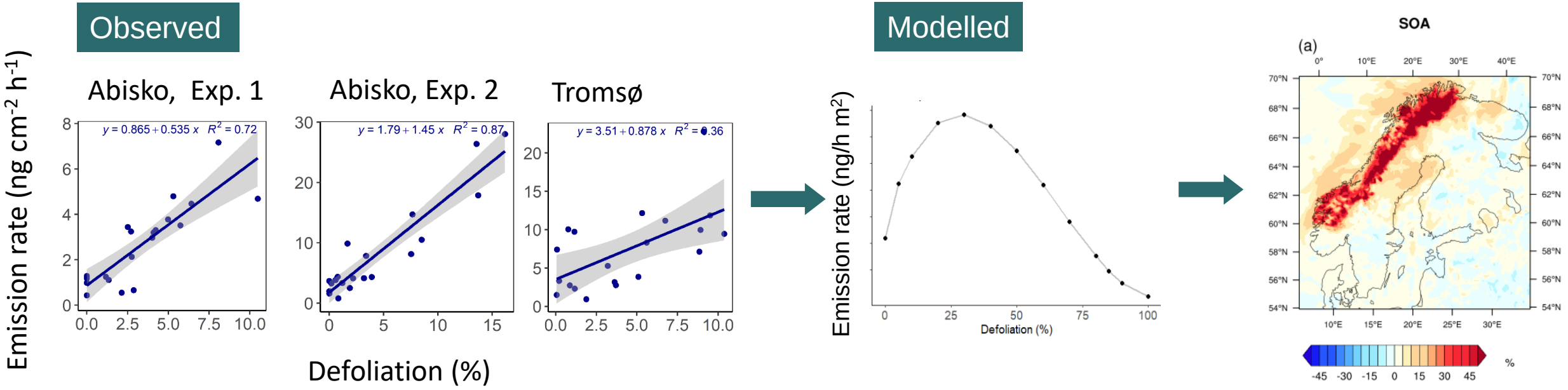
Rieksta et al. (2020) https://doi.org/10.3389/fpls.2020.558979

Change in the emission rate in response to increasing defoliation



- **Quantitative understanding of the relationship between the severity of insect herbivore damage and emissions of BVOCs.**
- **The results have important and practical implications for modeling induced and constitutive BVOC emissions and their feedbacks to atmospheric chemistry.**


#BirchforestVOCs

Thank you!

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