



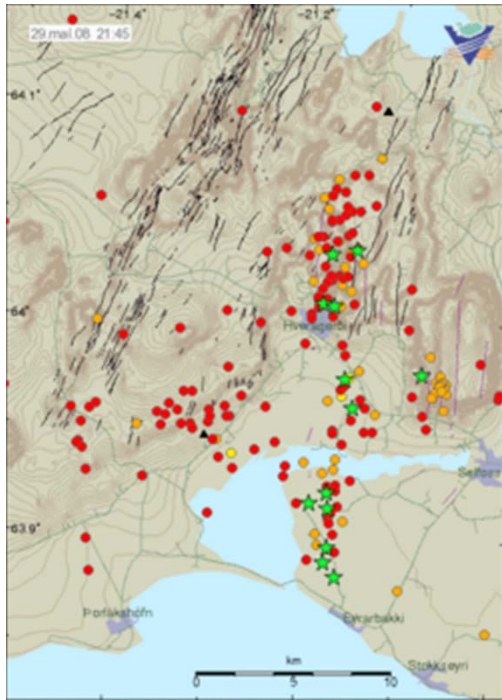
The effects of elevated soil temperatures on ectomycorrhizal community and litter decomposition in a Sitka spruce forest in southern Iceland

Edda Sigurdís Oddsdóttir

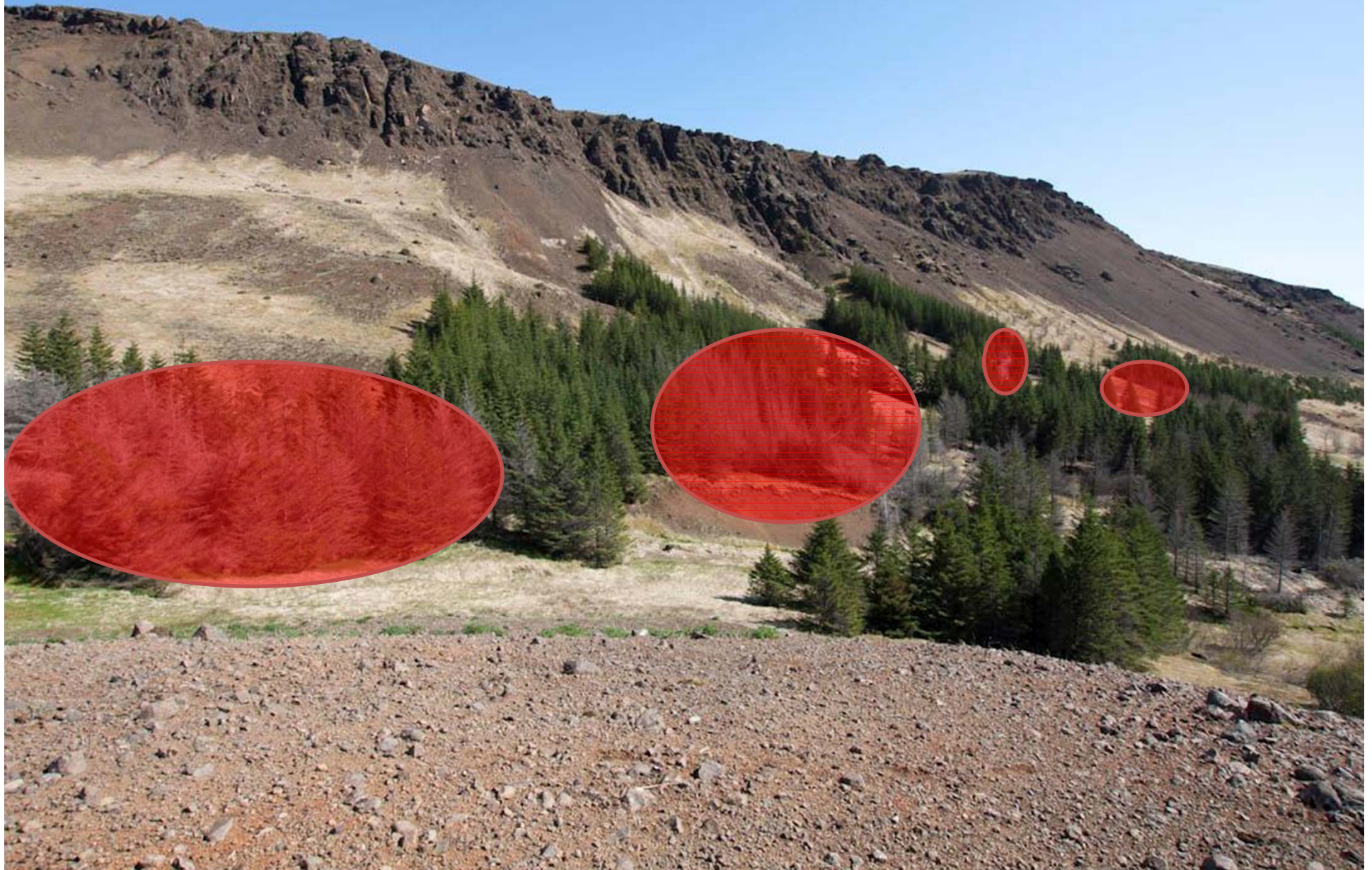
Icelandic Forest Research

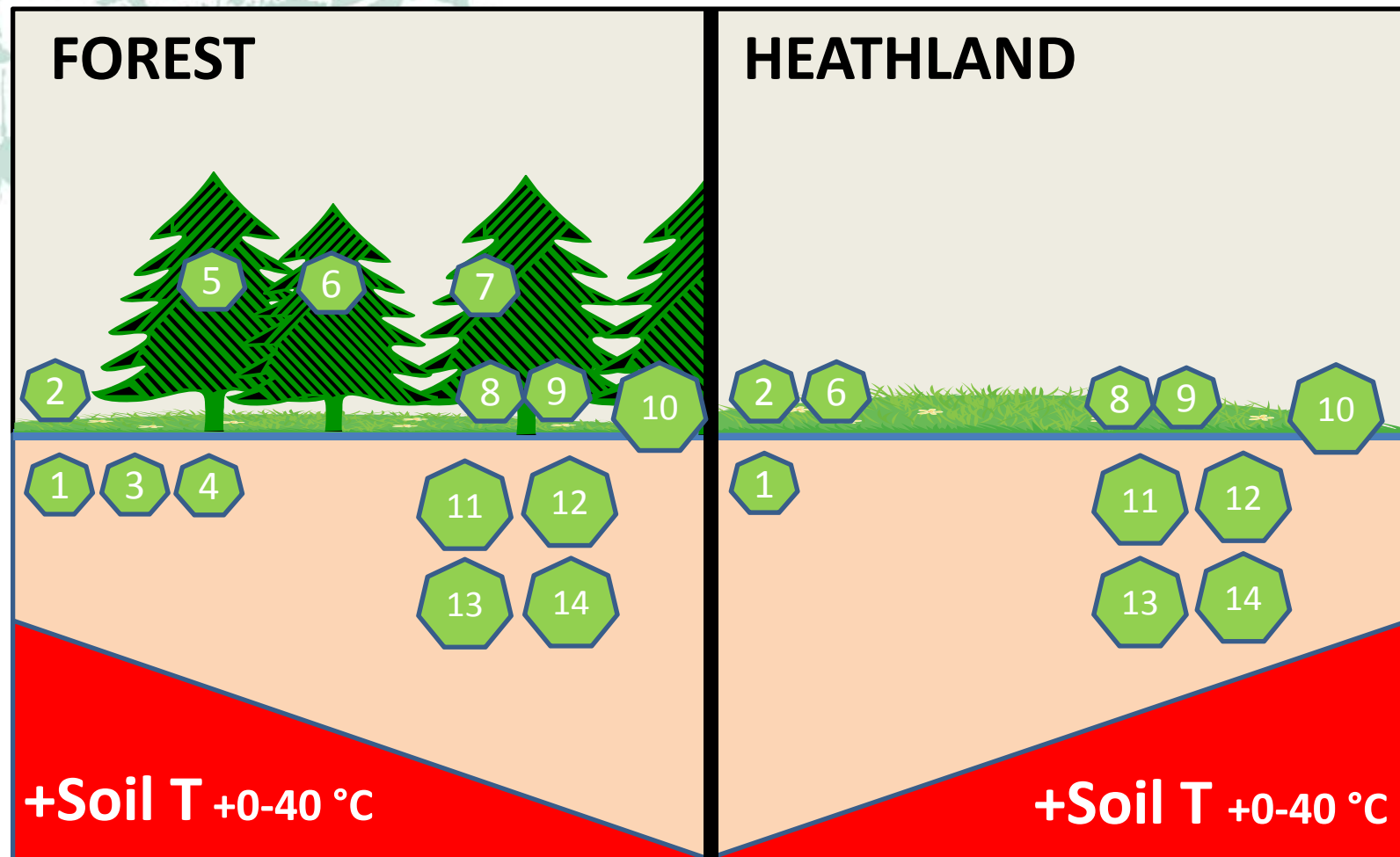
Ella Thoen, Håkan Wallander, Kesara Anamthawat-Jonsson
and Bjarni D. Sigurdsson

The ForHot site - not so hot -



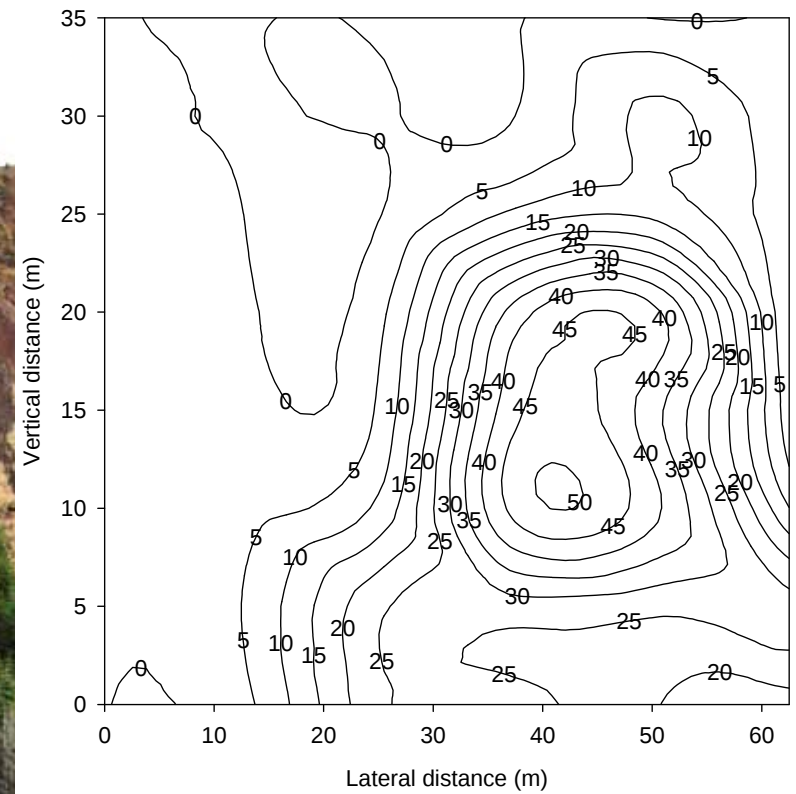
The ForHot site





- 1) Monitoring of soil T + Soil water status + Air T;
- 2) Monitoring of ground vegetation composition ;
- 3) Ectomycorrhizae on tree roots;
- 4) Fine-root dynamics;
- 5) Tree growth;
- 6) Plant N/P status;
- 7) Tree CO₂/H₂O fluxes

- 8) Continuous measurements of surface CO₂ fluxes;
- 9) CH₄ and N₂O surface fluxes;
- 10) Litter-bag study on decomposition;
- 11) Soil morphology;
- 12) Soil N and P cycle;
- 13) DNA studies on soil microbes;
- 14) NH₃ mineralization and Archaeobacteria



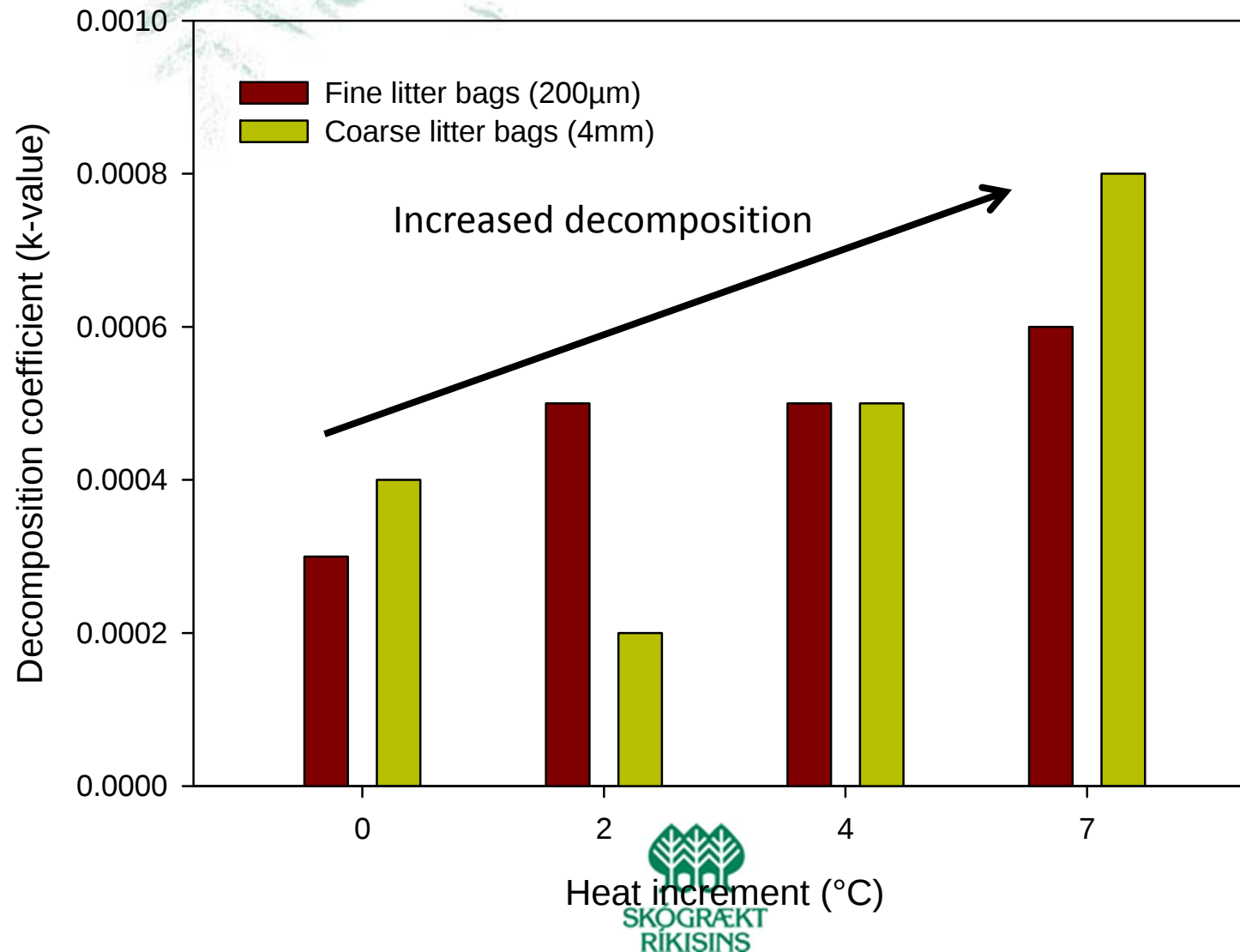
Forest: 2500 m²
Highest tree 13 m
46 year old, unthinned
3000 tree/ha
5 years of soil warming

Litter decomposition

- Sitka spruce needles in mesh bags
 - Fine (200 μ m) => microorganisms
 - Coarse (4mm) => microorganisms and arthropods
- Installed in autumn 2011
- Harvested after
 - 40, 73, 188, 293 and 376 days
- The litter dried and weighted
- Decomposition rate (k-value)

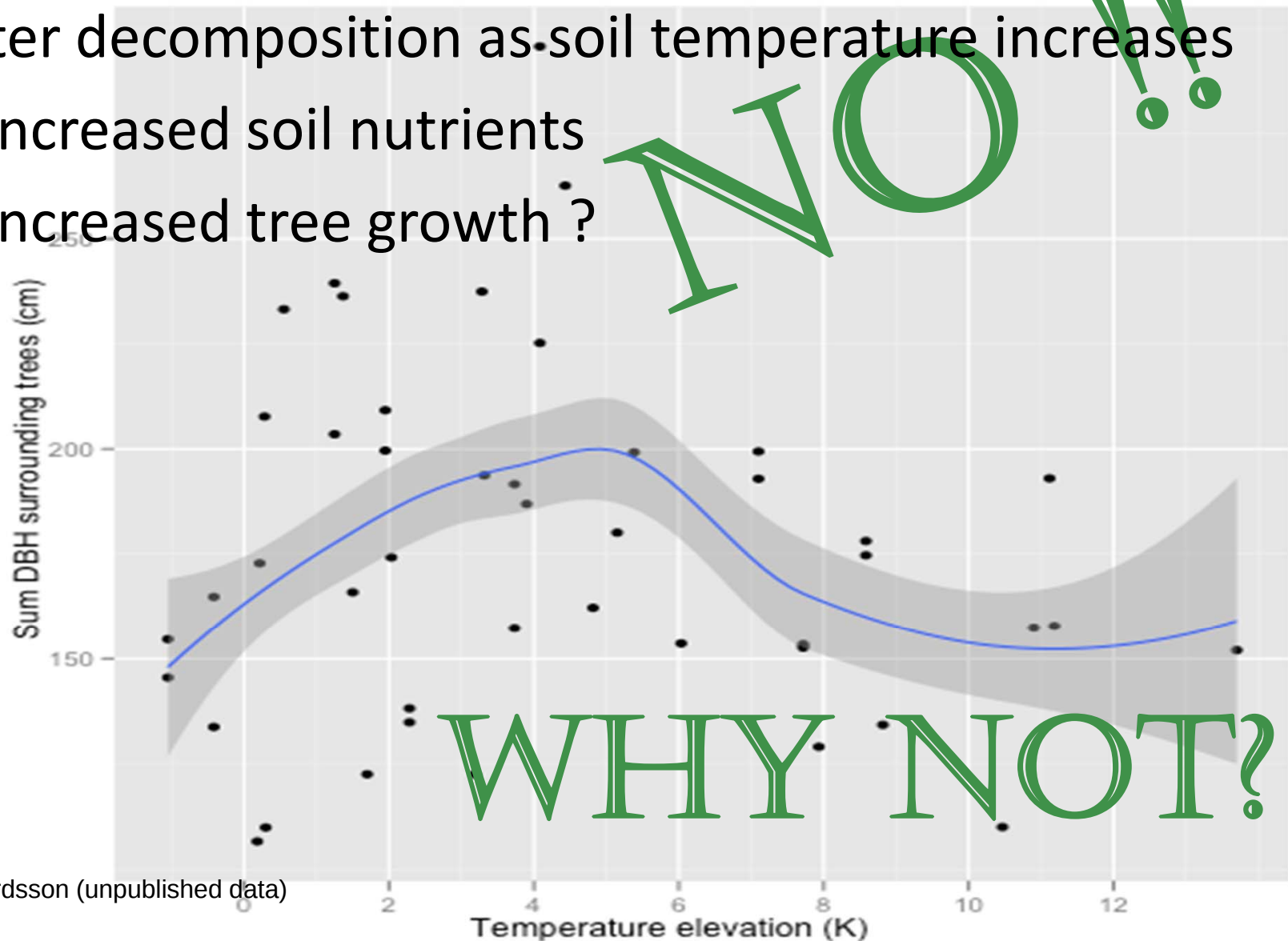


Decomposition coefficient -k-value-



What does this mean?

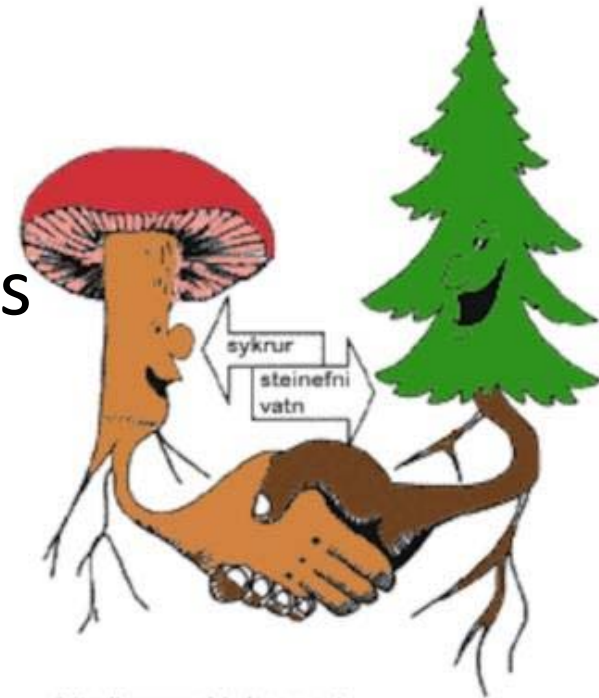
Faster decomposition as soil temperature increases
=> increased soil nutrients
=> increased tree growth ?



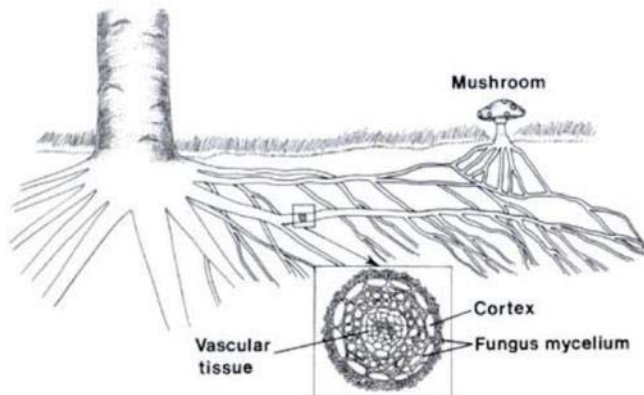
Lenz & Sigurdsson (unpublished data)

Soil fungi

- Ectomycorrhizal (ECM) root tips
 - Number
 - Morphotypes
- Fungal hyphae in mesh bags
 - Abundance grade (1-6)
 - Morphology of hyphae



<http://www.waldwissen.net>

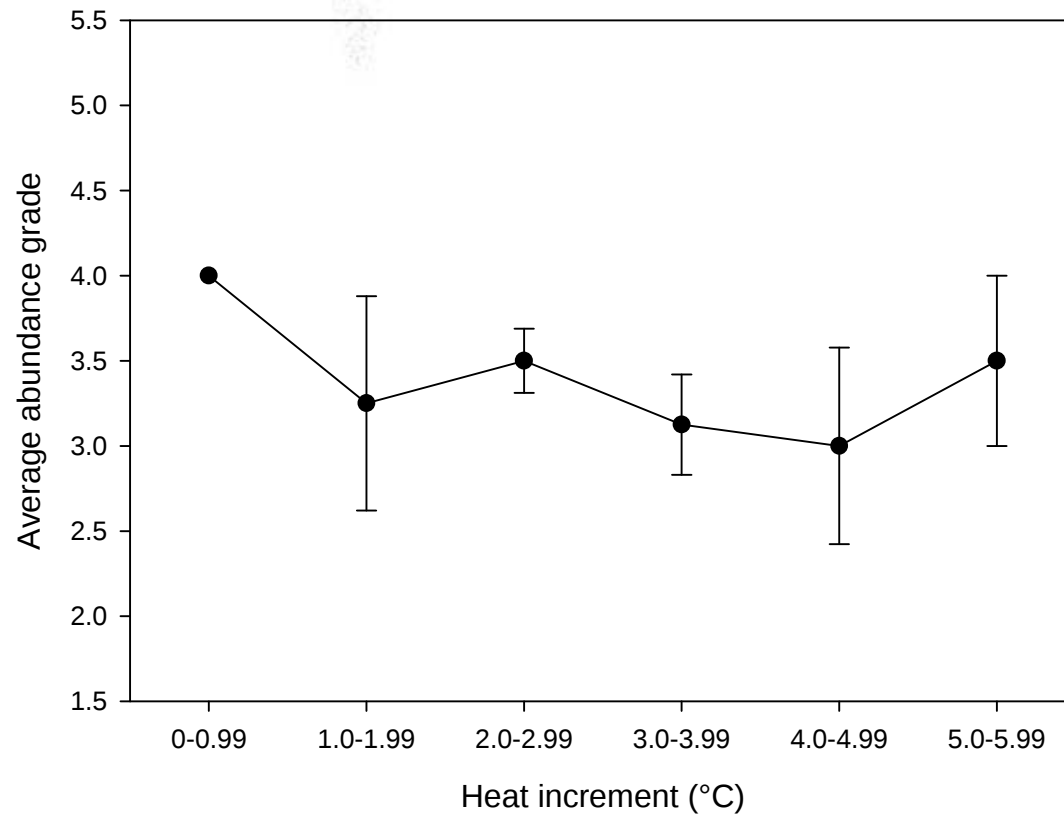


<http://www.apsnet.org/education/illustratedglossary/Photos-I-M/mycorrhiza.htm>



Mycelium from mesh bags

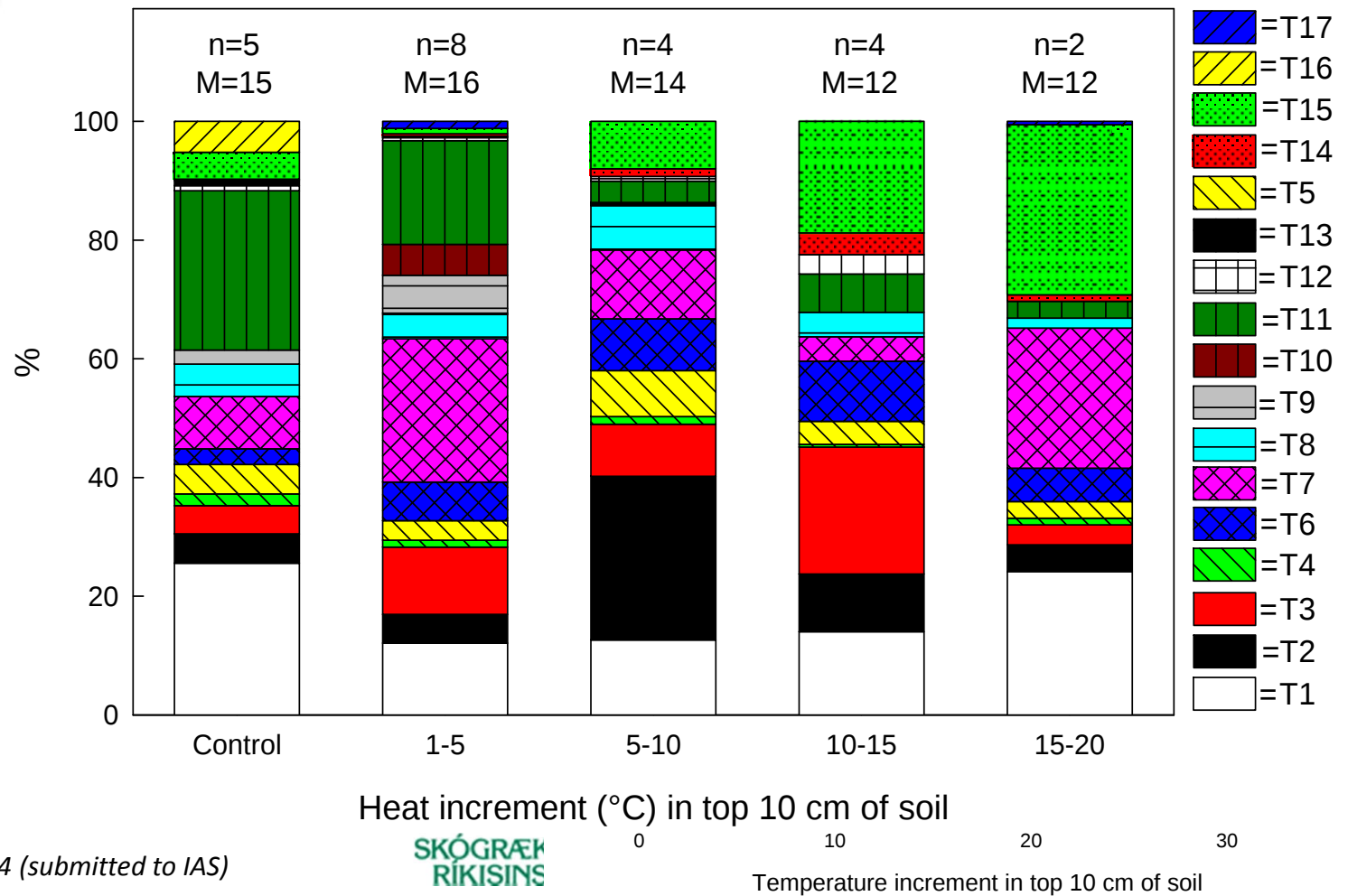
-average abundance grade-



Slight tendency to decrease in mycelium as soil temperature increases after one growth season



ECM on roots



Thoen et al 2014 (submitted to IAS)

SKÓGRÆÐ
RIKISINS



Conclusions

- Faster decomposition of litter should increase soil nutrients
- Tree grow faster up to 5°C increment soil T
- After 5°C tree growth slows down
- Is there something missing??
 - Studies on mycorrhiza and fungi indicate so

ForHot

Natural soil warming in a natural grassland and a Sitka spruce forest in Iceland

Participating Institutions

- Agricultural University of Iceland
- Icelandic Forest Research
- University of Iceland
- The Icelandic Institute of Natural History
- Basel University, Switzerland
- Lund University, Sweden
- Vrije University, Amsterdam, Netherlands
- NIOO-KNAW, Netherlands
- University of Eastern Finland
- METLA, Finland
- University of Antwerp, Belgium
- University of Tartu, Estonia
- Aarhus University

