Vittring i ett förändrat klimat: vad kan vi lära oss av dynamisk modellering?

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Dynamisk

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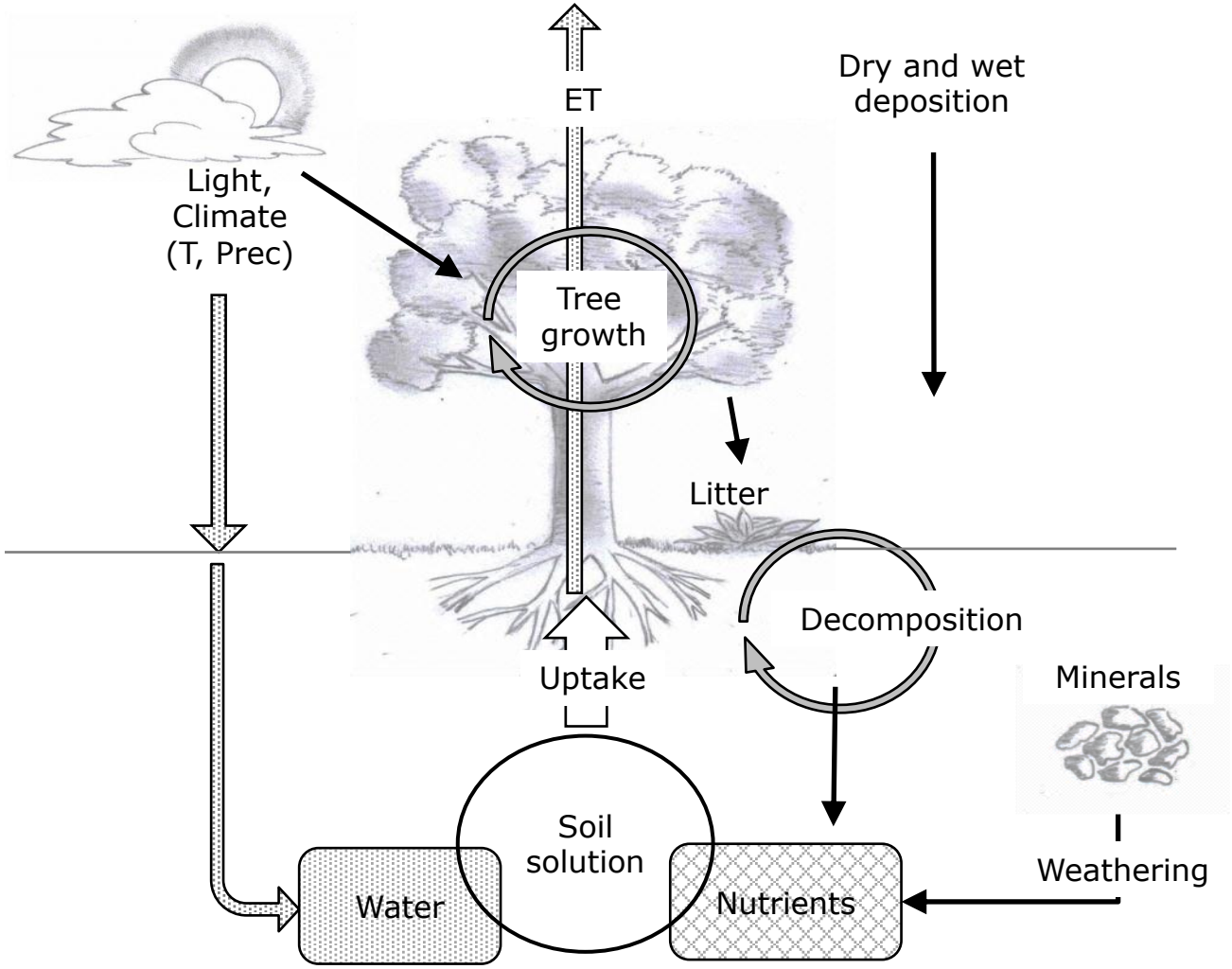
självjusterande

Möjligheter:

1- Processintegration

2- Upp-skalning i tid och rum

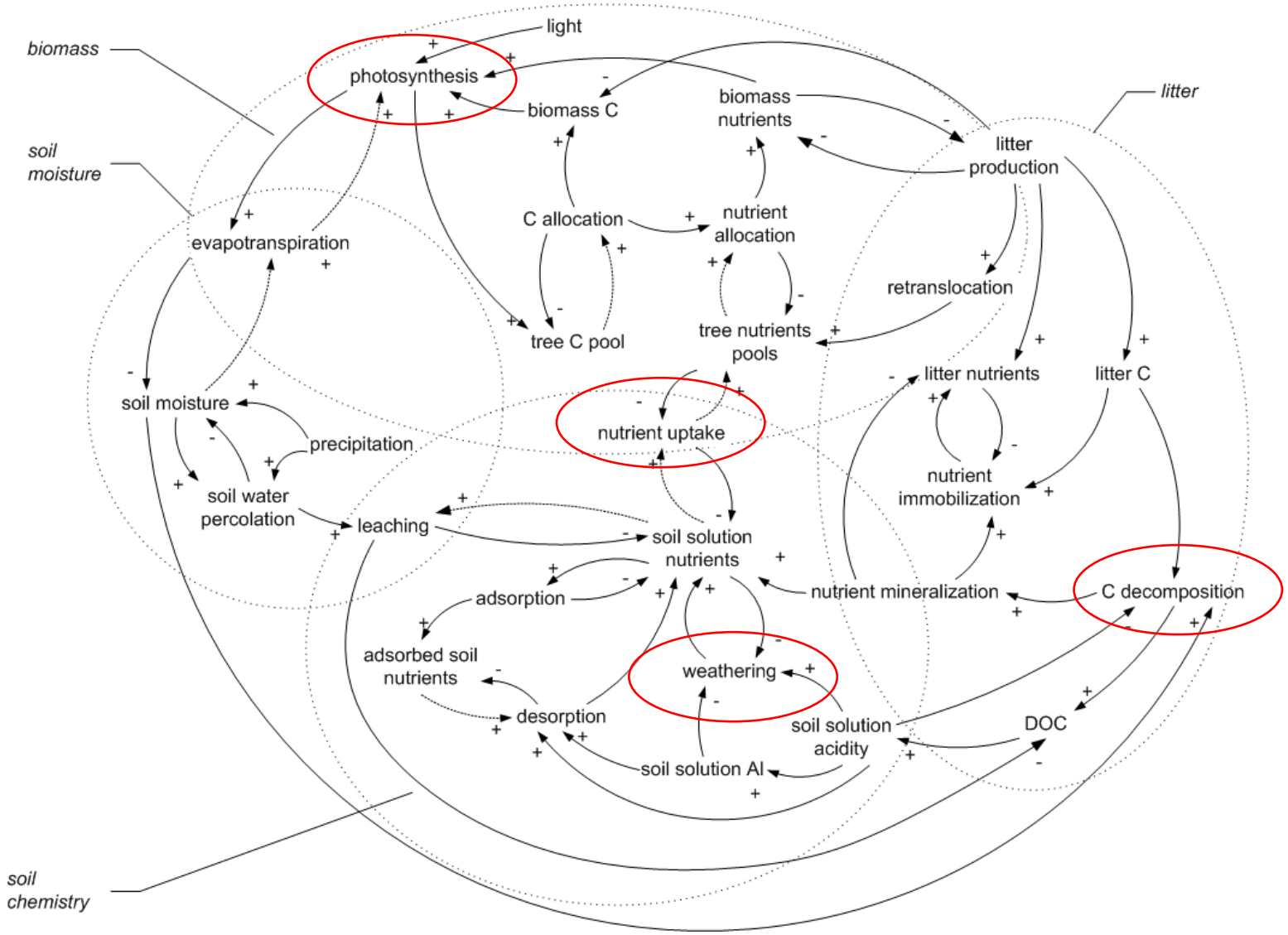
3- Kumulativa effekter



En modellerares syn på ett träd

- Luft
- Solenergi
- Mineraler
- Vatten

Processerna länkar samman flöden



1- Processintegration

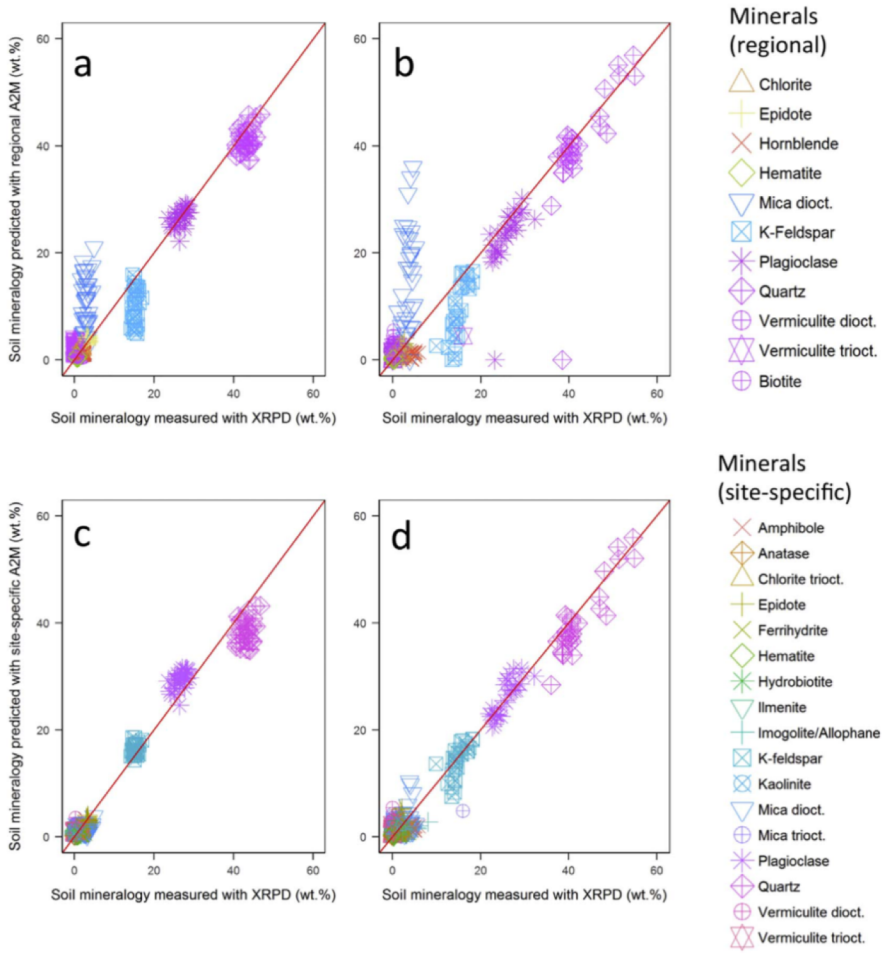
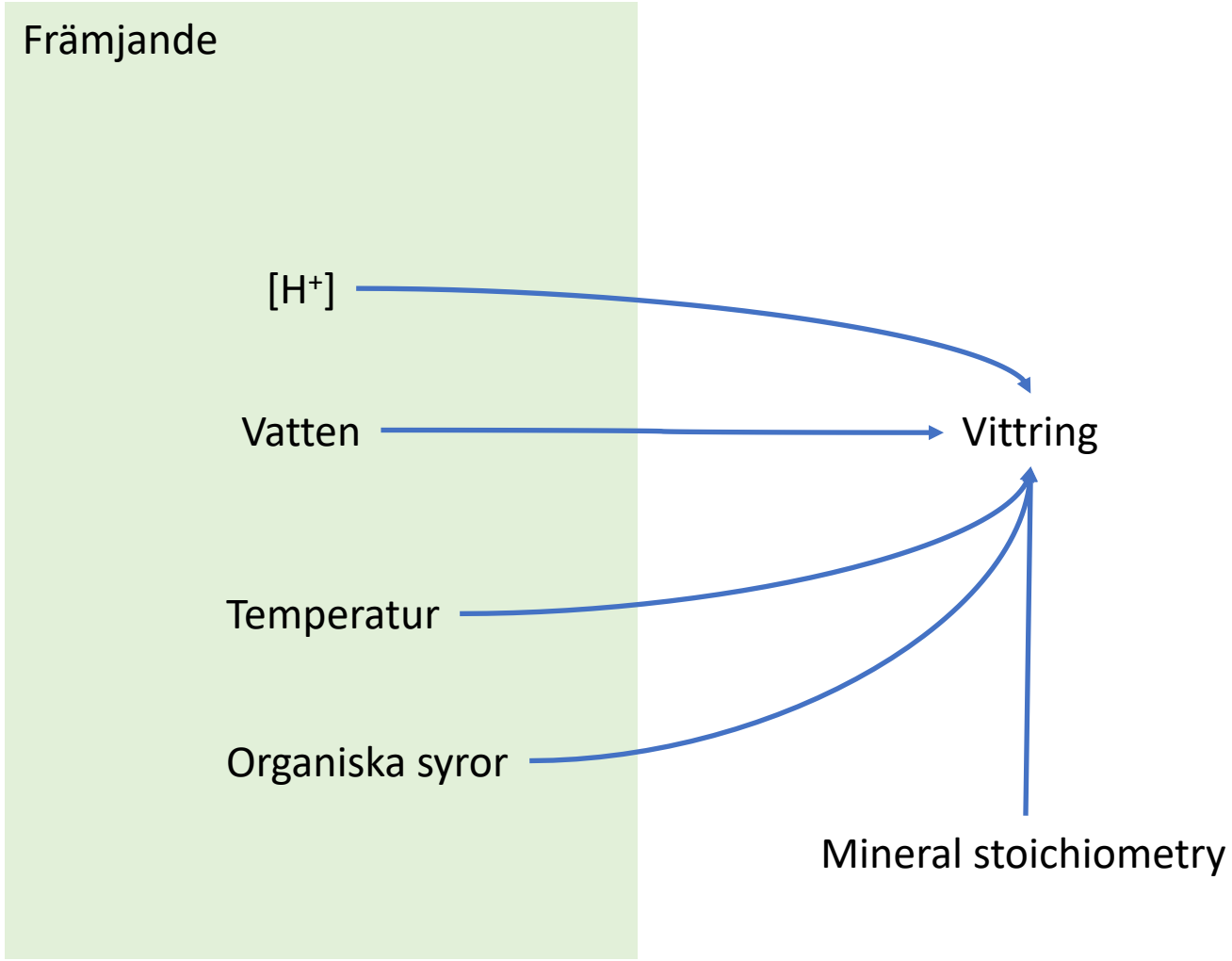


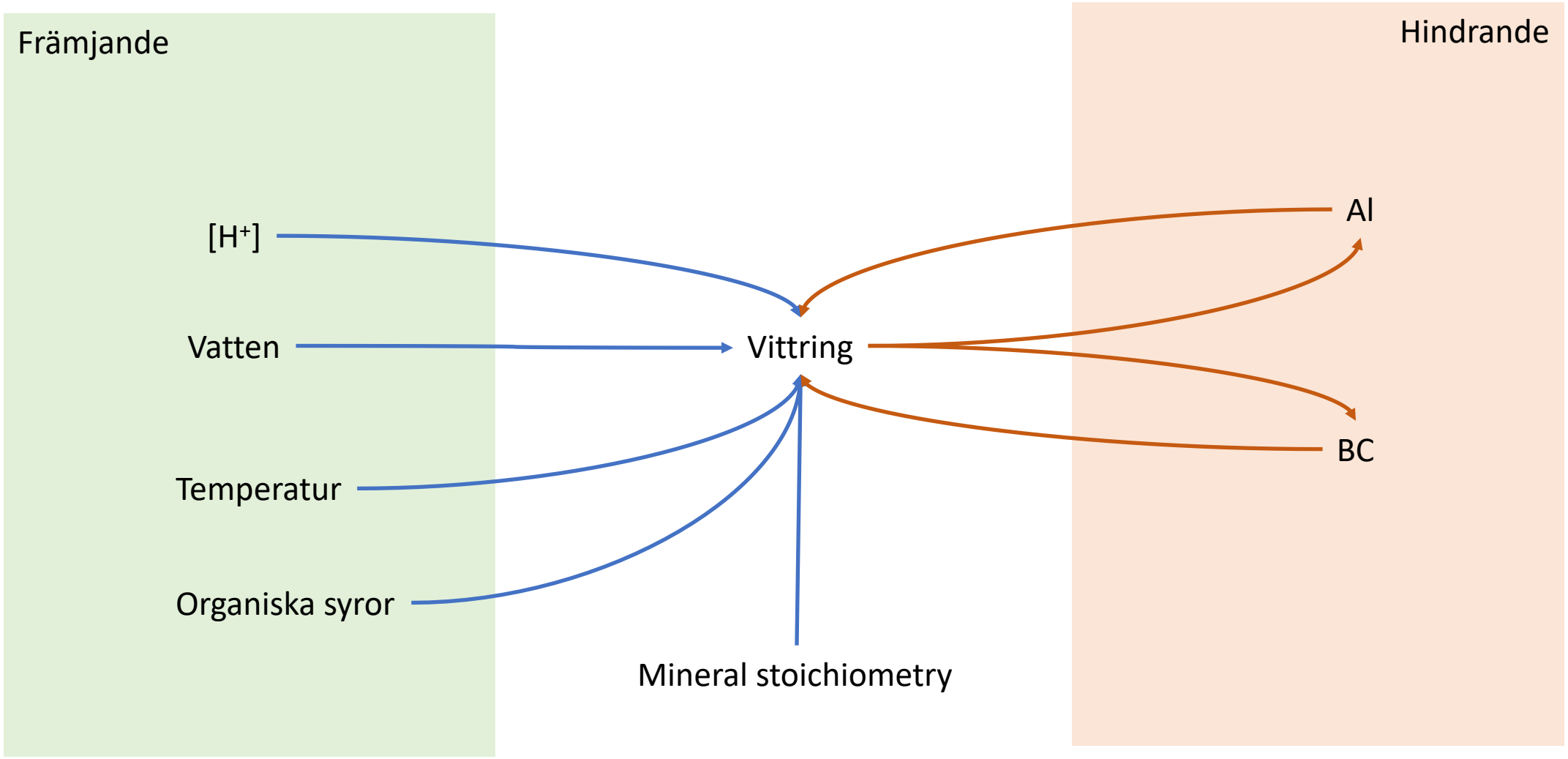
Fig. 4. a-b: Relationship between minerals predicted with regional A2M runs (wt%) and minerals measured directly by XRPD (wt%) for: (a) Asa soils and (b) Flakaliden soils. c-d: Relationship between minerals predicted with site-specific A2M (wt%) and measured with XRPD (wt%) for: (c) Asa soils and (d) Flakaliden soils. A 1:1 relationship is illustrated by a red line in each graph. Note the trends quasi parallel to the y axis indicating mineralogical variation according to A2M that is not observed by XRPD.

Casetou et al., 2018

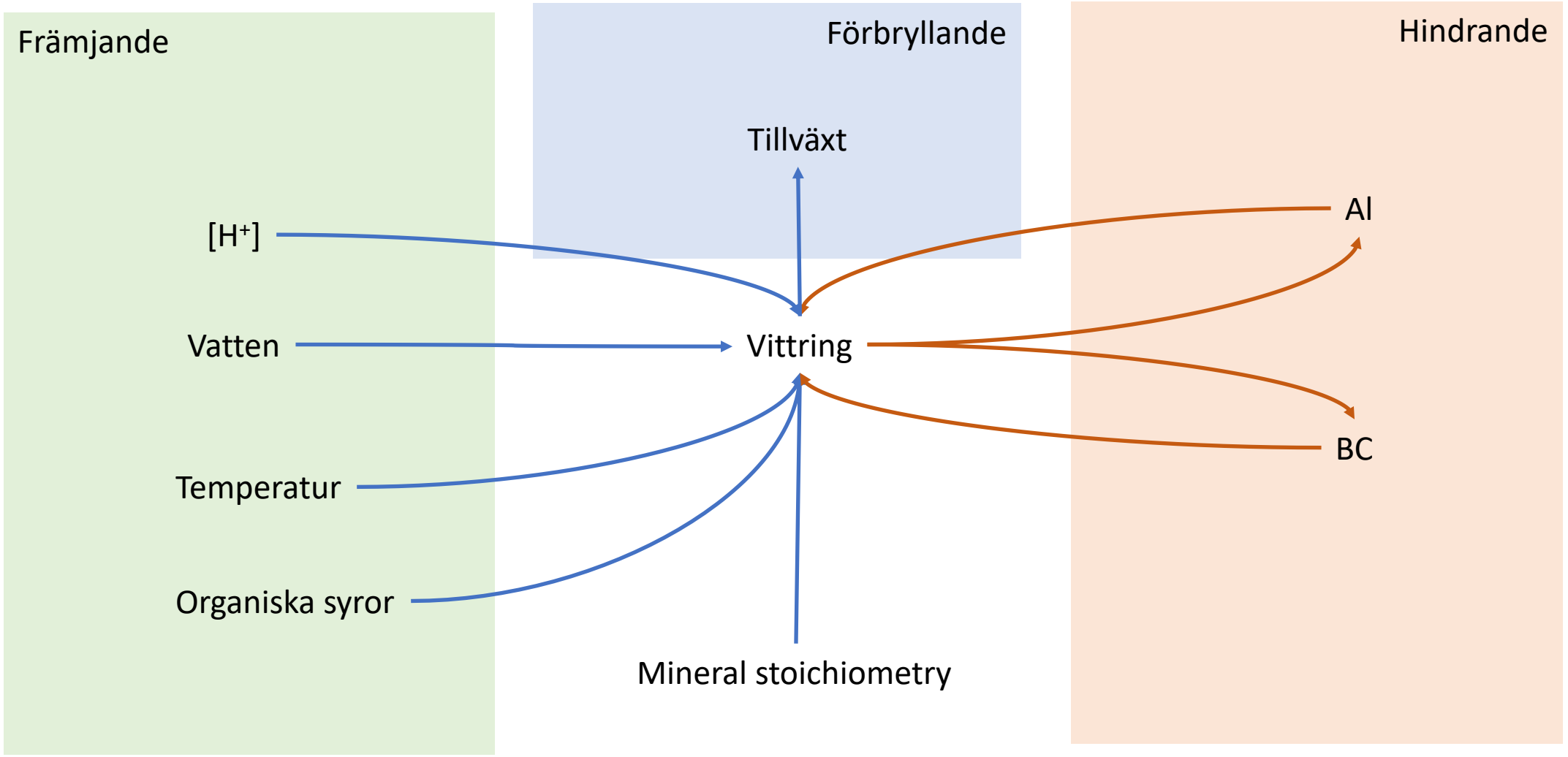
1- Processintegration



1- Processintegration



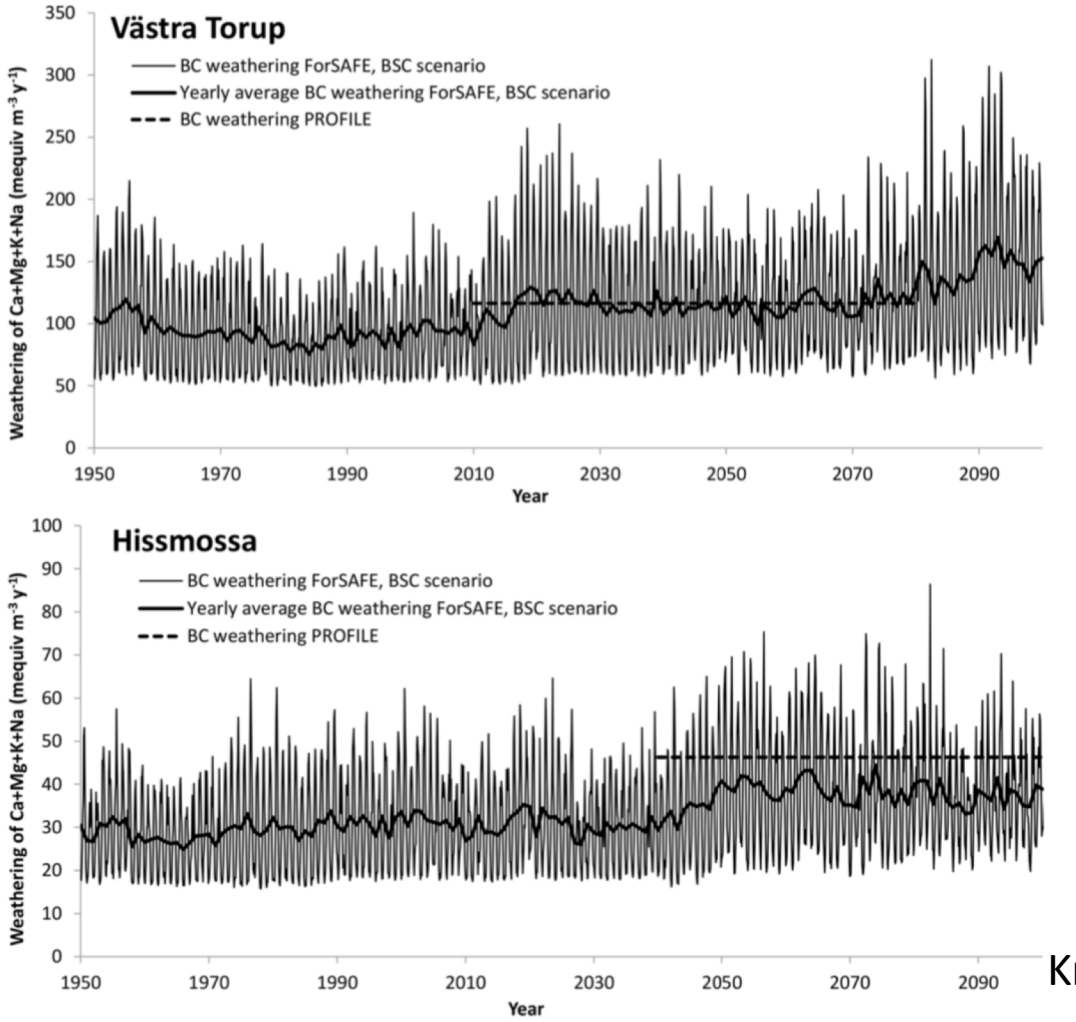
1- Processintegration



1- Processintegration

"Seasonality":

"När" viktig för "Var" vittringsprodukter hamnar

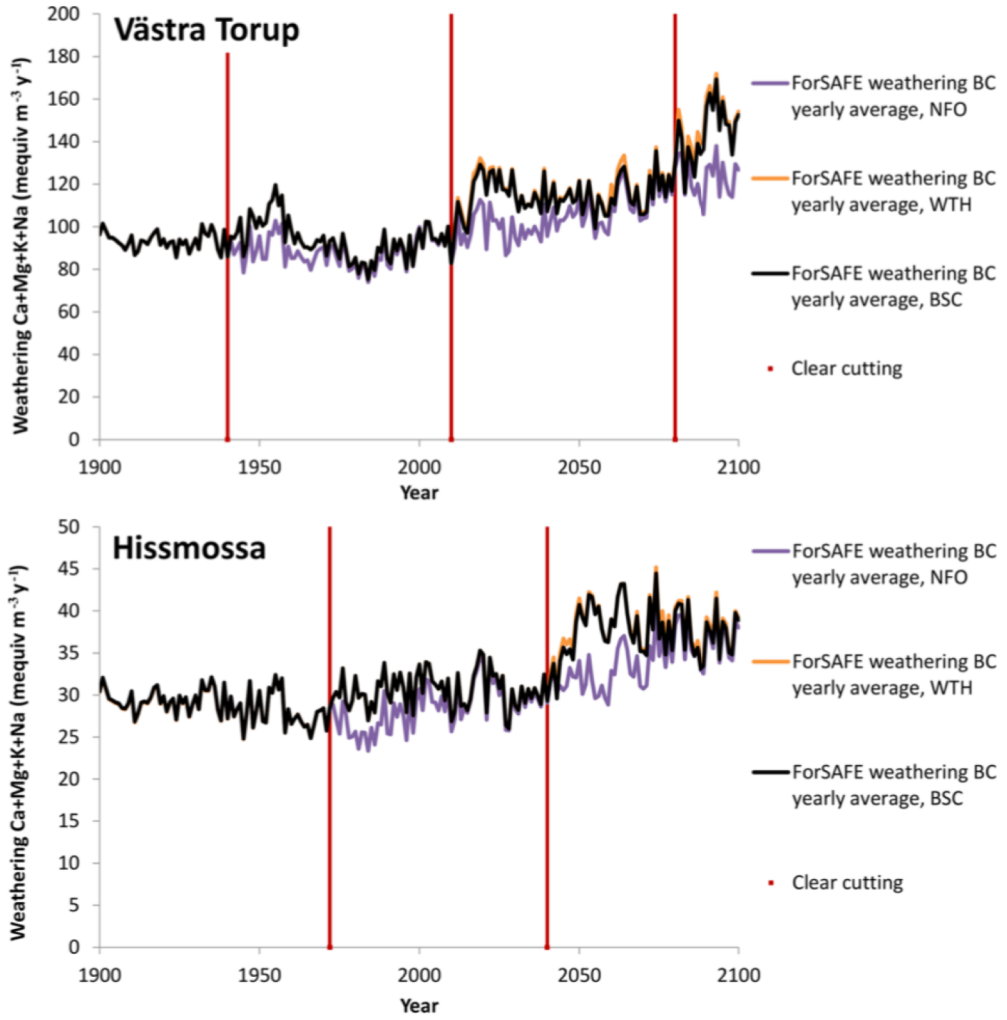


Kronnäs et al., 2019

Figure 3. Modelled Ca + Mg + K + Na weathering in Västra Torup and Hissmossa from 1950–2100 (note the difference in scale for the two sites). PROFILE calculates the average weathering rates for the time period represented by the input values, while monthly weathering values were calculated with ForSAFE, using the BSC scenario.

1- Processintegration

Kontinuerlig & transitorisk förändring



Kronnäs et al., 2019

Figure 4. Yearly average weathering of base cations in the whole soil profile, for the BSC scenario, the whole-tree harvest WTH scenario, and the NFO scenario without any clear cutting or thinning. The years of clear cuts in the BSC and WTH scenarios are marked with vertical lines. In Västra Torup clear cuts are in the years 1940, 2010 and 2080 and in Hissmossa in 1972, 2040 and 2101.

1- Processintegration

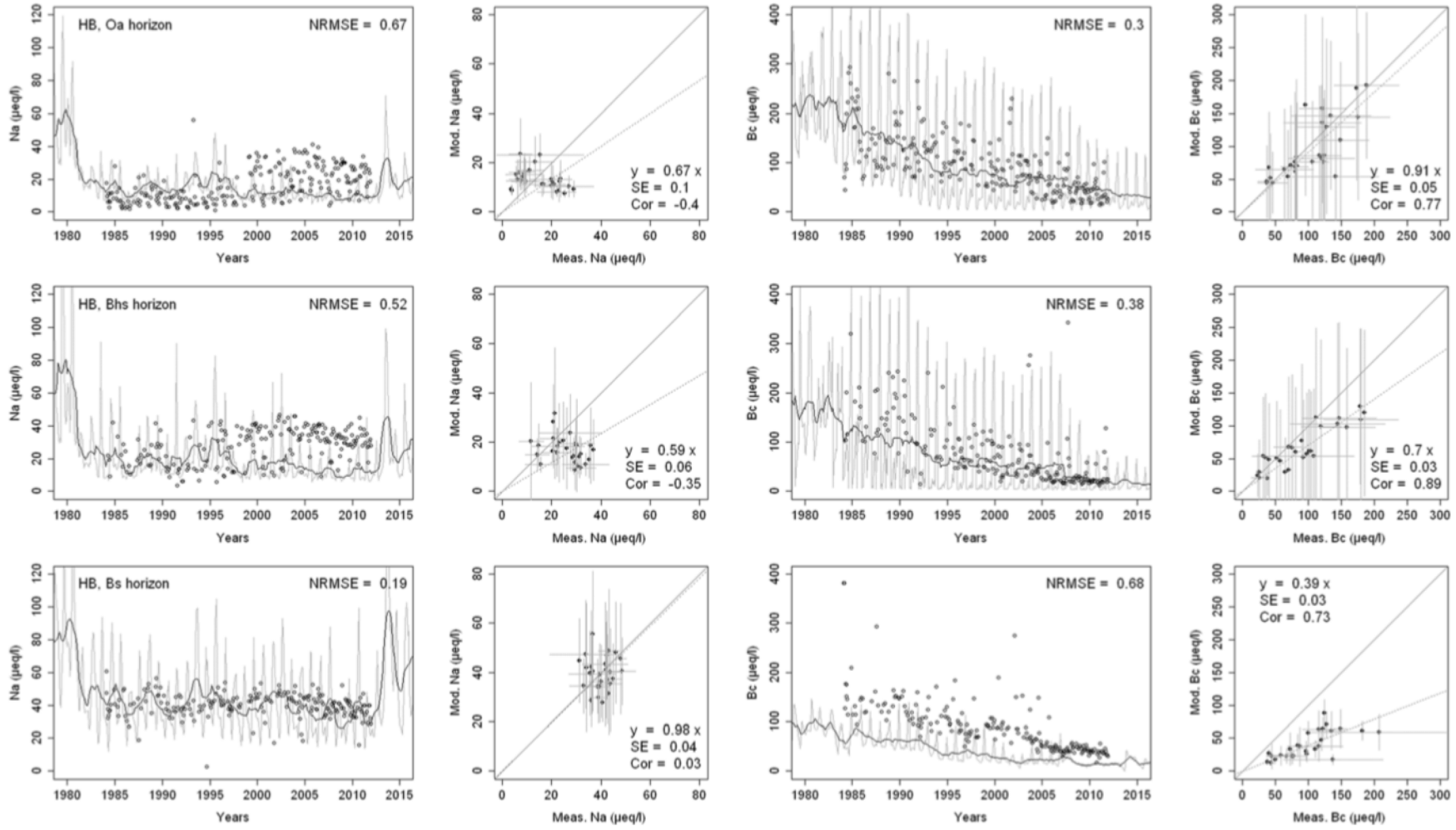


Fig. 3 Modeled and measured soil solution concentrations of sodium (Na^+) and base cations (Bc^{2+}; Ca^{2+}, Mg^{2+} + K^+) at three depths at Hubbard Brook Experimental Forest (HBEF). In the first and third columns, the dark lines show modeled 12-month moving averages, the gray lines show modeled monthly values, and the points are field measurements. The second and fourth columns show 1:1 correlations of yearly medians and standard deviations of modeled and field measured concentrations

Belyazid et al., 2019

1- Processintegration

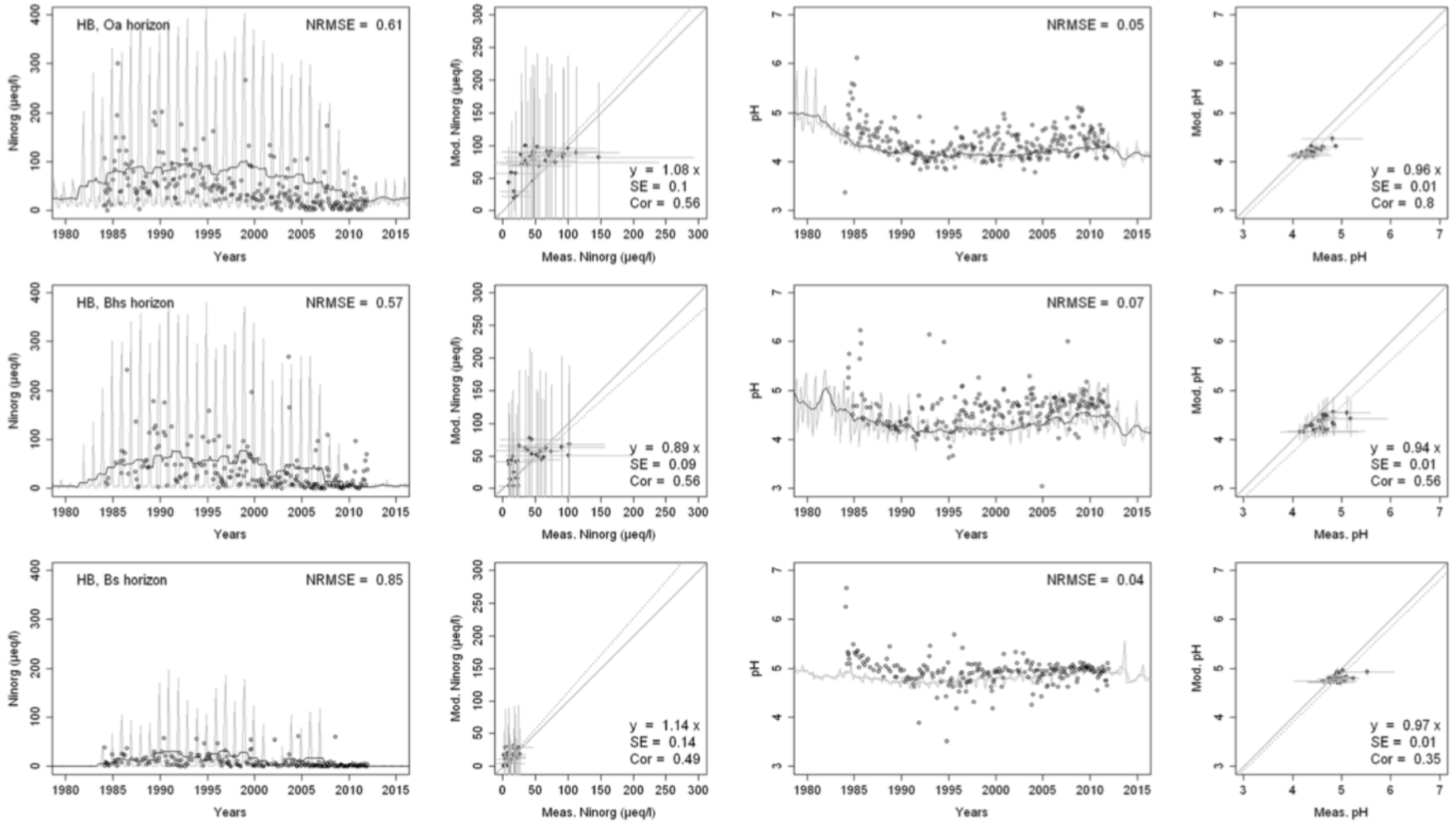


Fig. 4 Modeled and measured soil solution concentrations of inorganic nitrogen ($NO_3^- + NH_4^+$) and pH at three depths at Hubbard Brook Experimental Forest (HBEF). In the first and third columns, the dark lines show modeled 12-month moving averages, the gray lines show modeled monthly values, and the points are field measurements. The second and fourth columns show 1:1 correlations of yearly medians and standard deviations of modeled and field measured concentrations

Belyazid et al., 2019

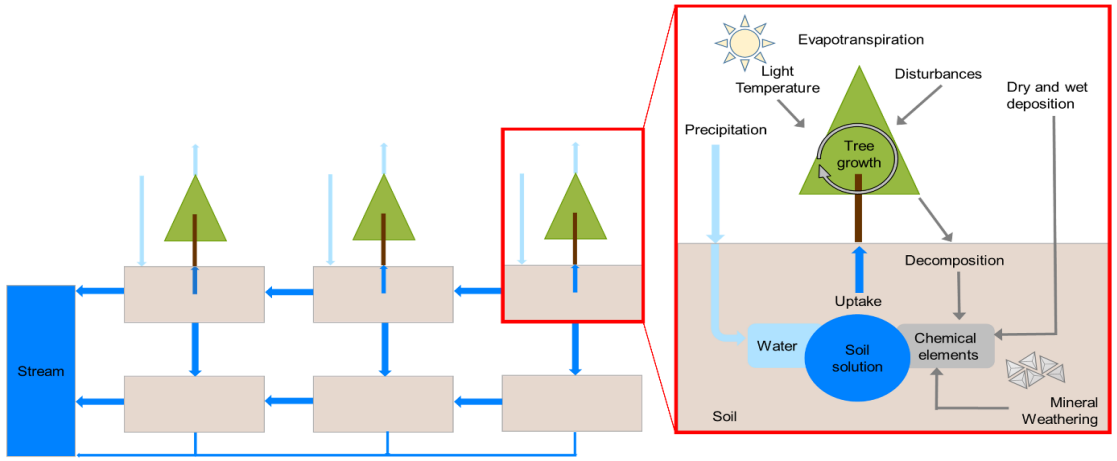
1- Processintegration

- De befintliga processerna räcker i rotzonen

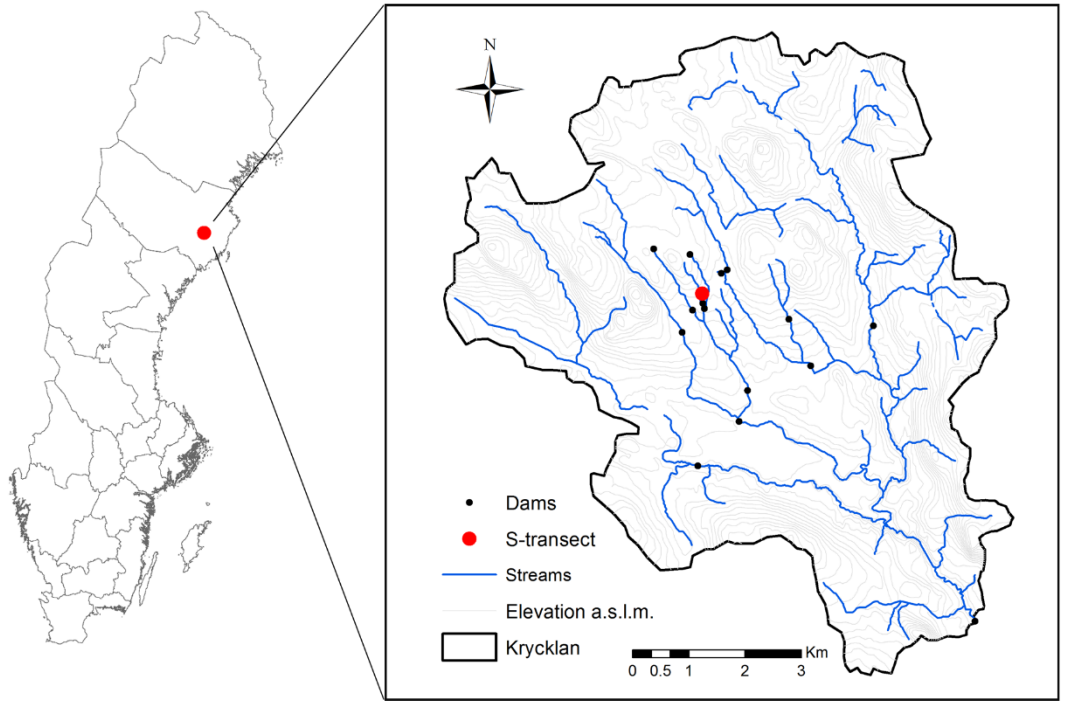
  (Akselsson et al., 2019; Kronnäs et al., 2019;
  Belyazid et al., in review; Belyazid et al., 2019;
  Erlandsson et al., 2019; Erlandsson et al., 2016)

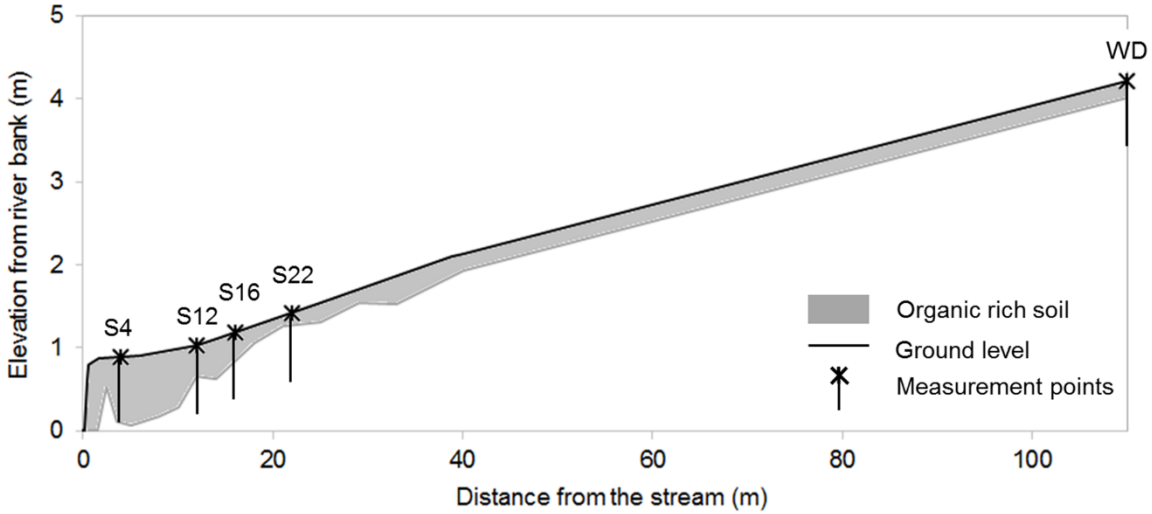
2- Uppskalning

Bestånd till landskap



Zanchi et al., in review

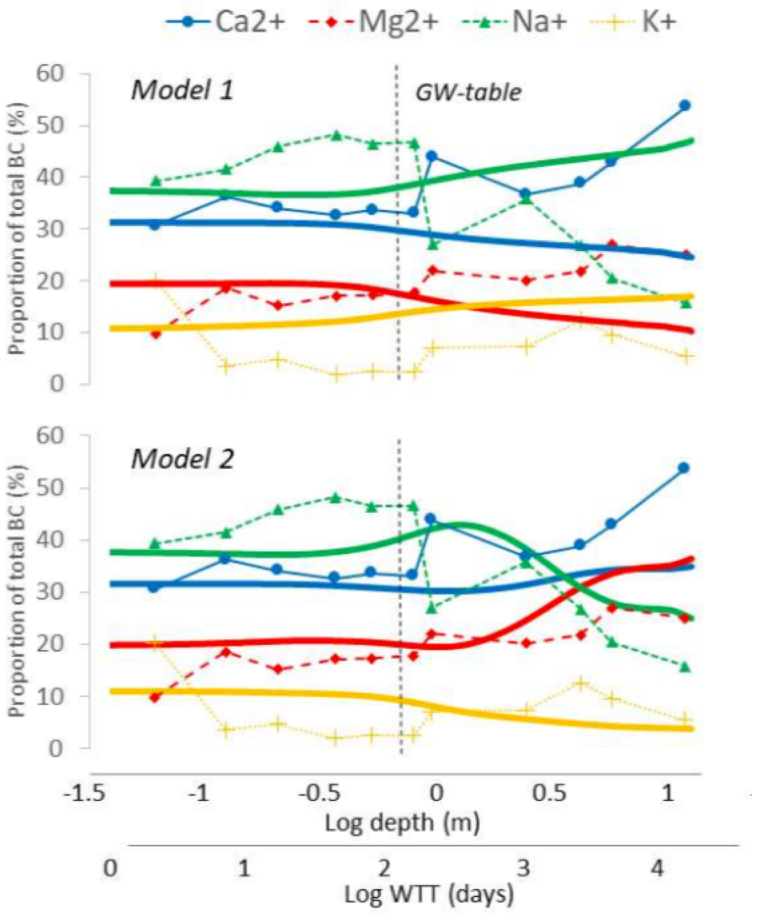




2- Uppskalning

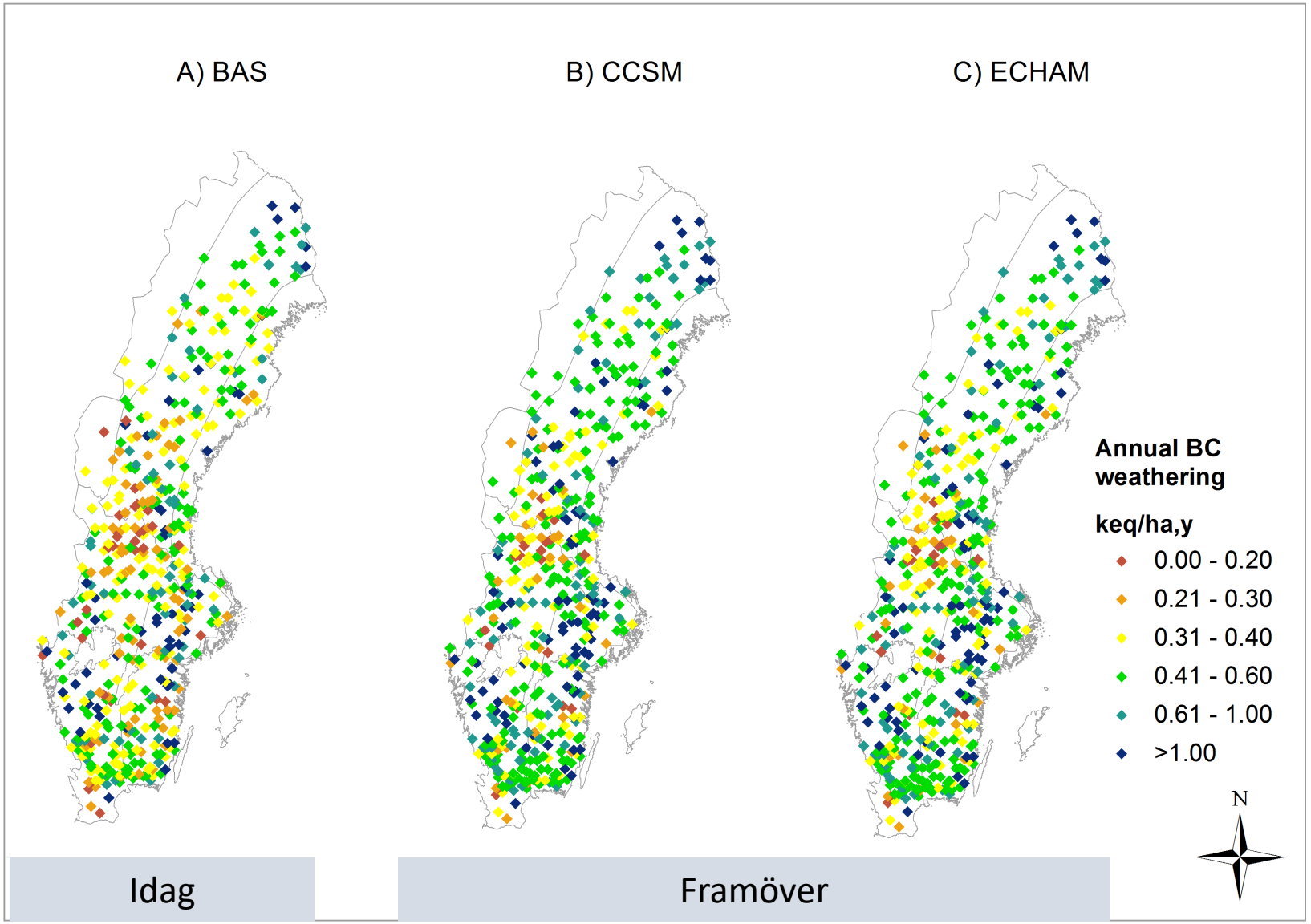
I den vattenmättade zonen:

- Kisel (Si) fördröjning
- OH^- upplösning



Erlandsson et al., 2020

2- Uppskalning



Belyazid et al., in review

2- Uppskalning

Uppskattning av bärkraften från BC perspektiv

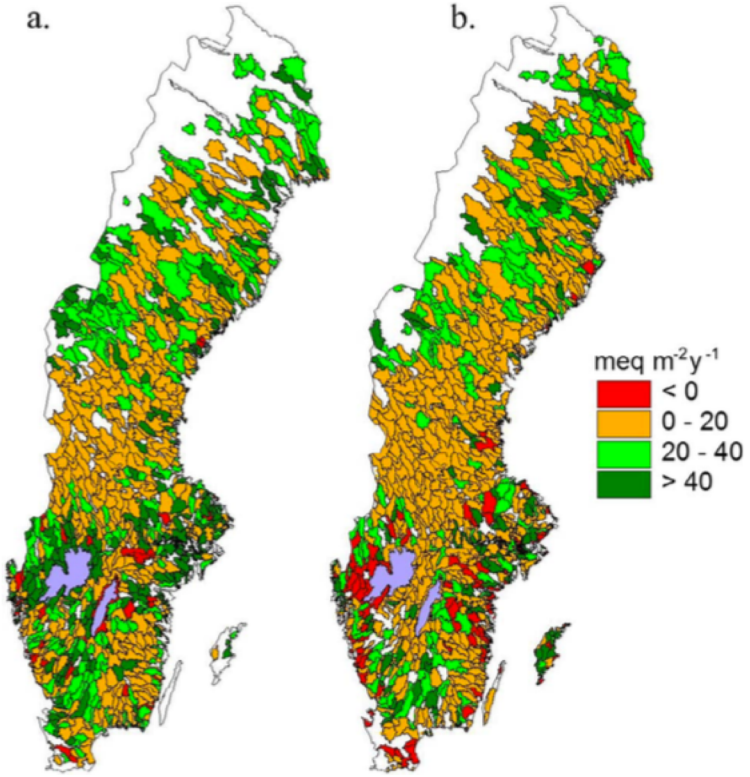


Fig. 2. Critical harvesting at the deposition of 2020 according to the EMEP model in spruce forests (a) and in pine forests (b).

Akselsson and Belyazid, 2018

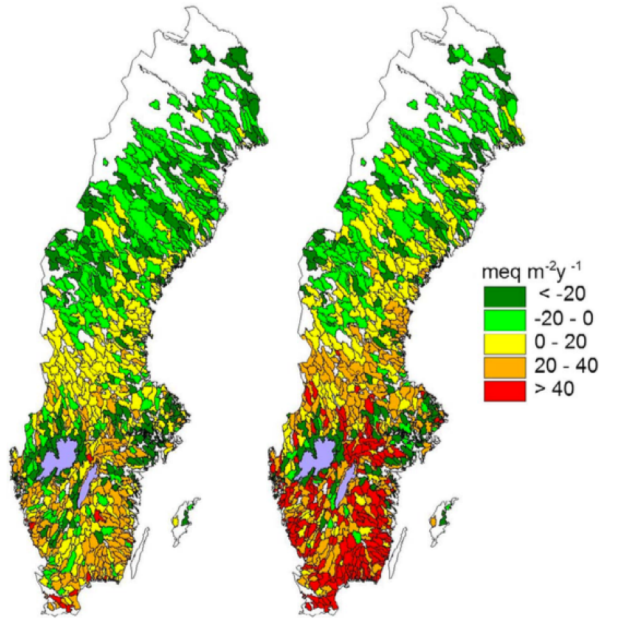


Fig. 3. Exceedance of critical harvesting in spruce forest at stem harvesting (a) and whole-tree harvesting (b).

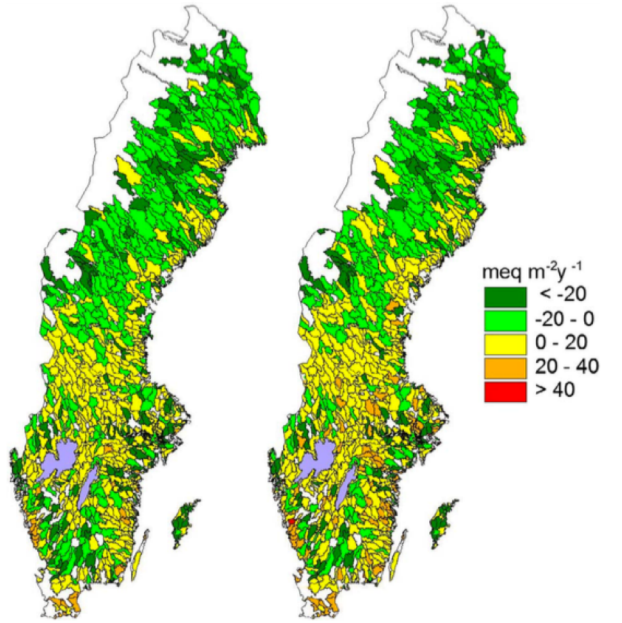
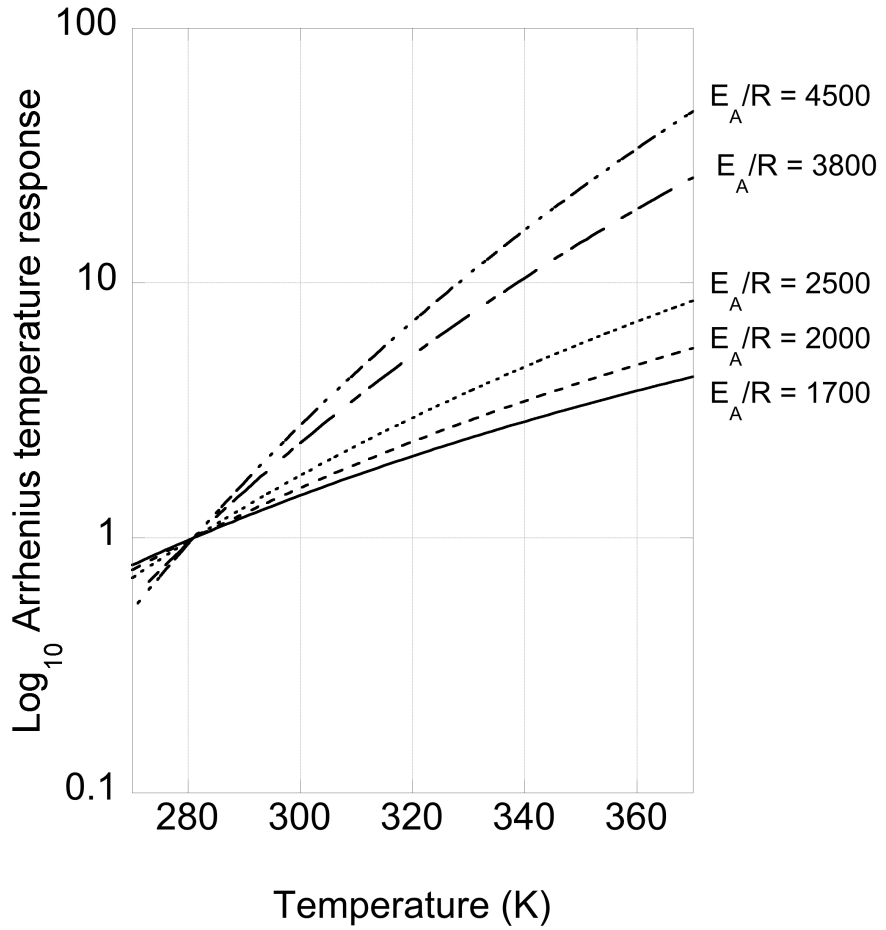


Fig. 4. Exceedance of critical harvesting in pine forest at stem harvesting (a) and whole-tree harvesting (b).

3- Kumulativa klimat effekter

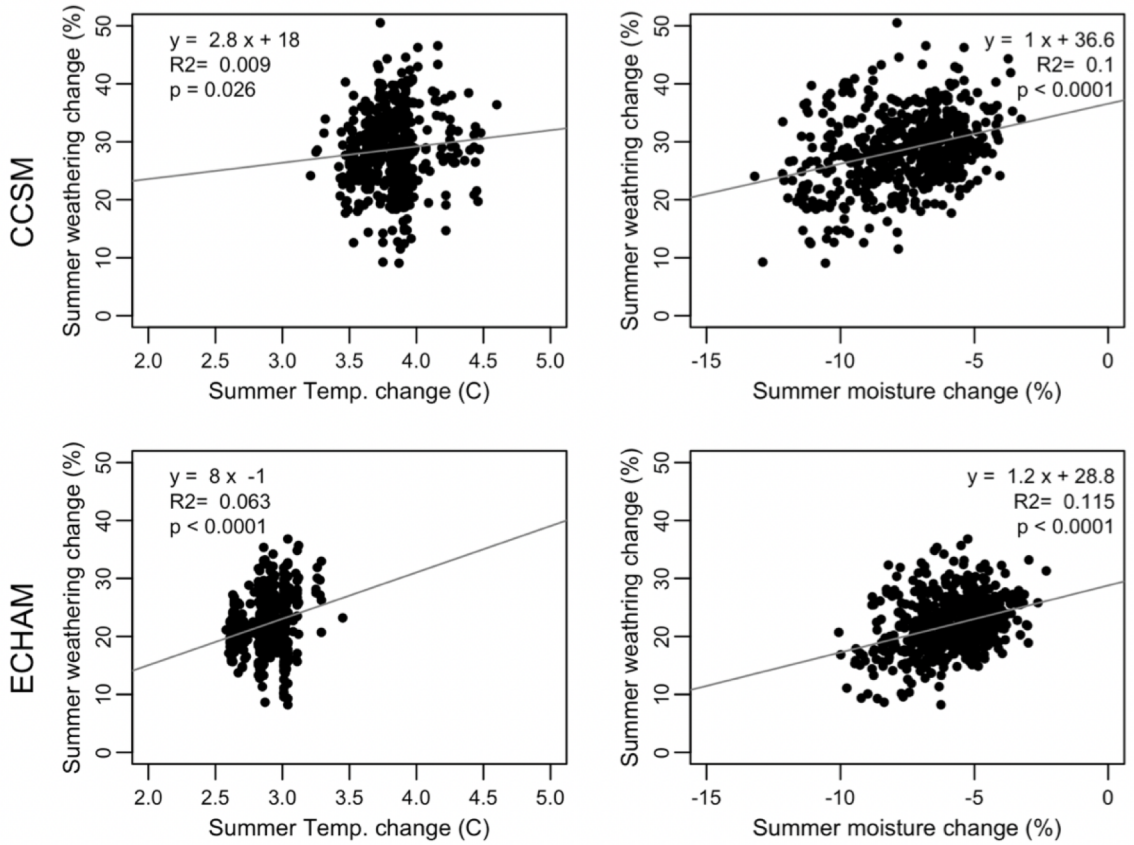
En framtid med fler simultana förändringar



<u>+10% vittring/°C</u>

3- Kumulativa klimat effekter

Enbart 6.6% till 6.7% per °C



Belyazid et al., in review

QWARTS publikationer inom WP-D

- Erlandsson et al., (2020). Catchment export of base cations: Improved mineral dissolution kinetics influence the role of water transit time. Soil.
- Erlandsson Lampa, M., Belyazid, S., Zanchi, G., Akselsson, C. (2019). Effects of whole-tree harvesting on soil, soil water and tree growth – A dynamic modelling exercise in four long-term experiments. Ecological Modelleing 414. doi: 10.1016/j.ecolmodel.2019.108832.
- Akselsson, C., Belyazid, S., Stendahl, J., Finlay, R., Olsson, B., Erlandsson Lampa, M., Wallander, H., Gustafsson, J.P., Bishop, K. (2019). Weathering rates in Swedish forest soils. Biogeosciences 16(22):4429-4450, https://doi.org/10.5194/bg-2019-1.
- Belyazid, S., Akselsson, C., Zanchi, G. (2019). Water limitation may restrict the positive effect of higher temperatures on weathering rates in forest soils. Biogeosciences Discuss (*in review*).
- Belyazid, S., Phelan, J., Nihlgård, B., Sverdrup, H., Driscoll, C., Fernandez, I., Aherne, J., Teeling-Adams, L., Bailey, S., Arsenault, M., Cleavitt, N., Engstrom, B., Dennis, R., Sperduto, D., Werier, D., Clark, C. (2019). Assessing the Effects of Climate Change and Air Pollution on Soil Properties and Plant Diversity in Northeastern U.S. hardwood forests: Model Setup and Evaluation. Water, Air and Soil Pollution 230:106.
- Belyazid, S., Zanchi, G. (2019). Water limitation can negate the effect of higher temperatures on forest carbon sequestration. European Journal of Forest Research, 138(2): 287-297. https://doi.org/10.1007/s10342-019-01168-4
- McGivney, E., Gustafsson, J.P., Belyazid, S., Zetterberg, T., Löfgren, S. (2019). Assessing the impact of acid rain and forest harvest intensity with the HD-MINTEQ model – Soil chemistry of three Swedish conifer sites from 1880 to 2080. Soil, https://doi.org/10.5194/soil-2018-17.
- Kronnäs, V., Akselsson, C., Belyazid, S. (2019). Dynamic modelling of weathering rates – is there any benefit over steady state modelling? Soil 5: 33-47.
- Gustafsson, J.P., Belyazid, S., McGivney, E., Löfgren, S. (2018). Aluminium and base cation chemistry in dynamic acidification models – need for a reappraisal? Soil 4(4): 237-250.
- Akselsson C, Belyazid S, (2018). Critical biomass harvesting – applying a new concept for Swedish forest soils. Forest Ecology and Management 409: 67-73.
- Van der Heijden G, Belyazid S, Dambrine E, Ranger J, Legout A, (2017). NutsFor a process-oriented model to simulate nutrient and isotope tracer cycling in forest ecosystems. Environmental Modelling and Software 95: 365-380.
- Casetou-Gustafson, S., Hillier, S., Akselsson, C., Simonsson, M., Stendahl, J., and Olsson, B.: Comparison of measured (XRPD) and modeled (A2M) soil mineralogies: A study of some Swedish forest soils in the context of weathering rate predictions, Geoderma, 310, 77-88, doi:10.1016/j.geoderma.2017.09.004,

Tack till alla Qwartsites!