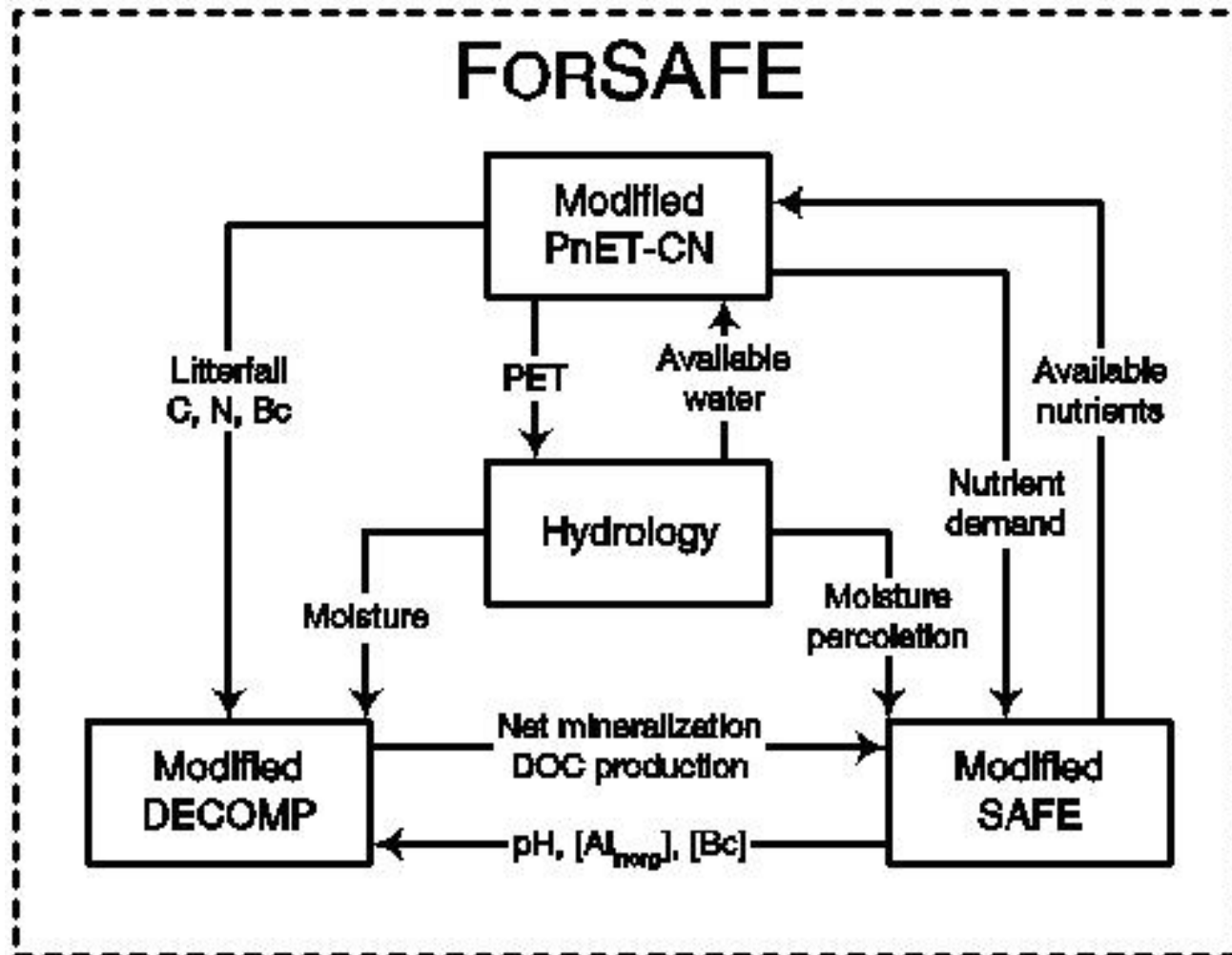


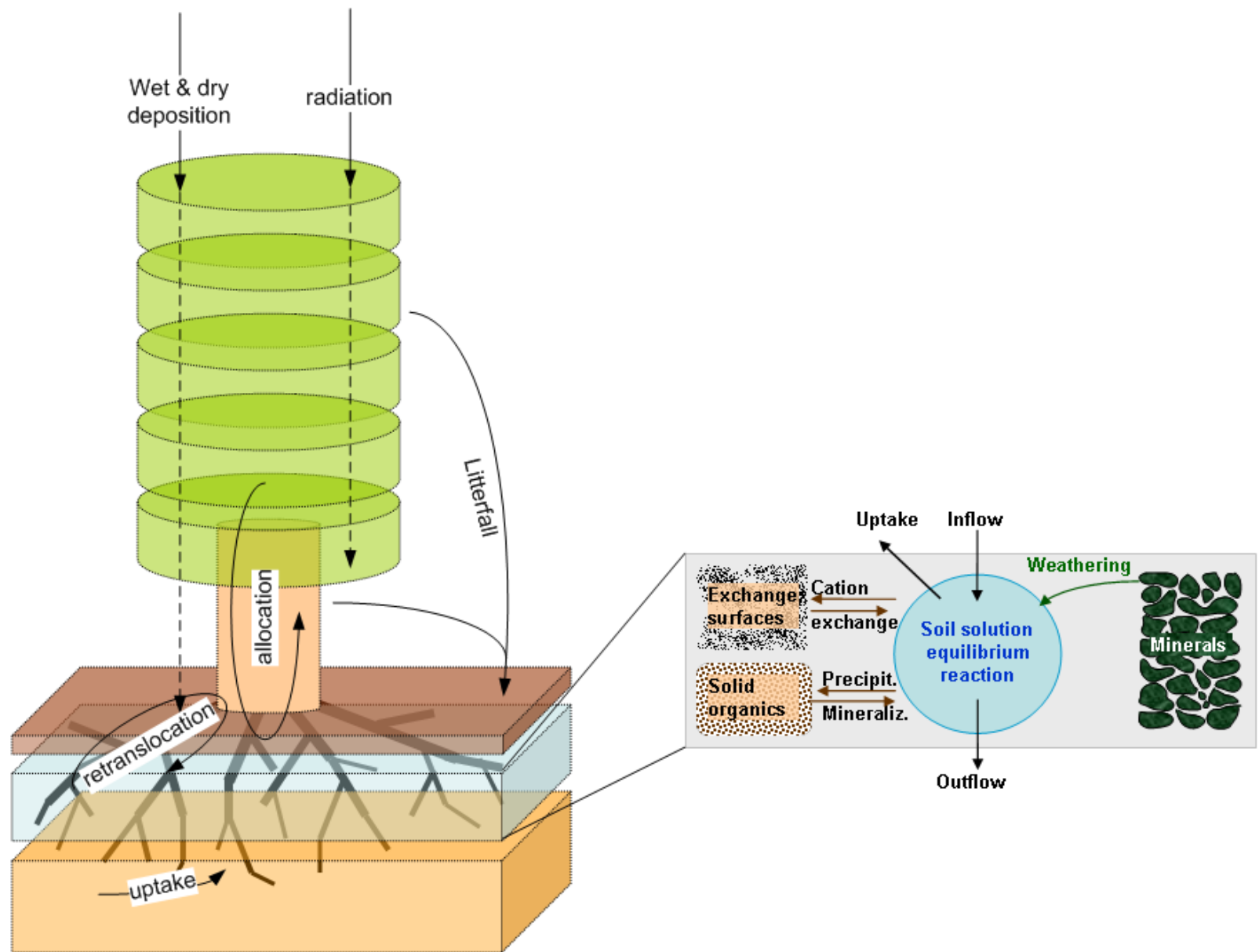
Modelling N deposition effects on forest ecosystems

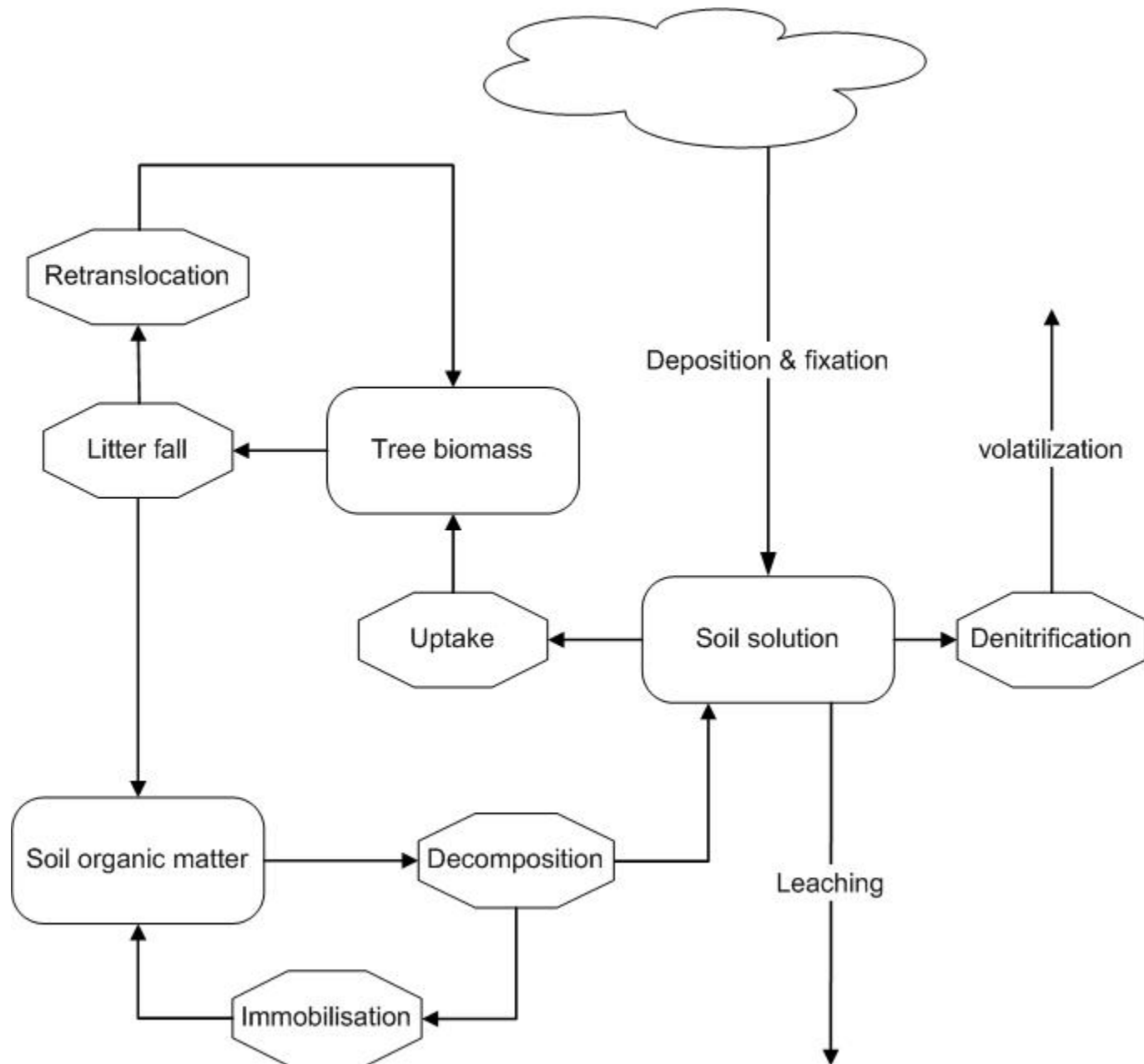
Salim Belyazid & Harald Sverdrup
Lund University, Sweden



Combining four existing models

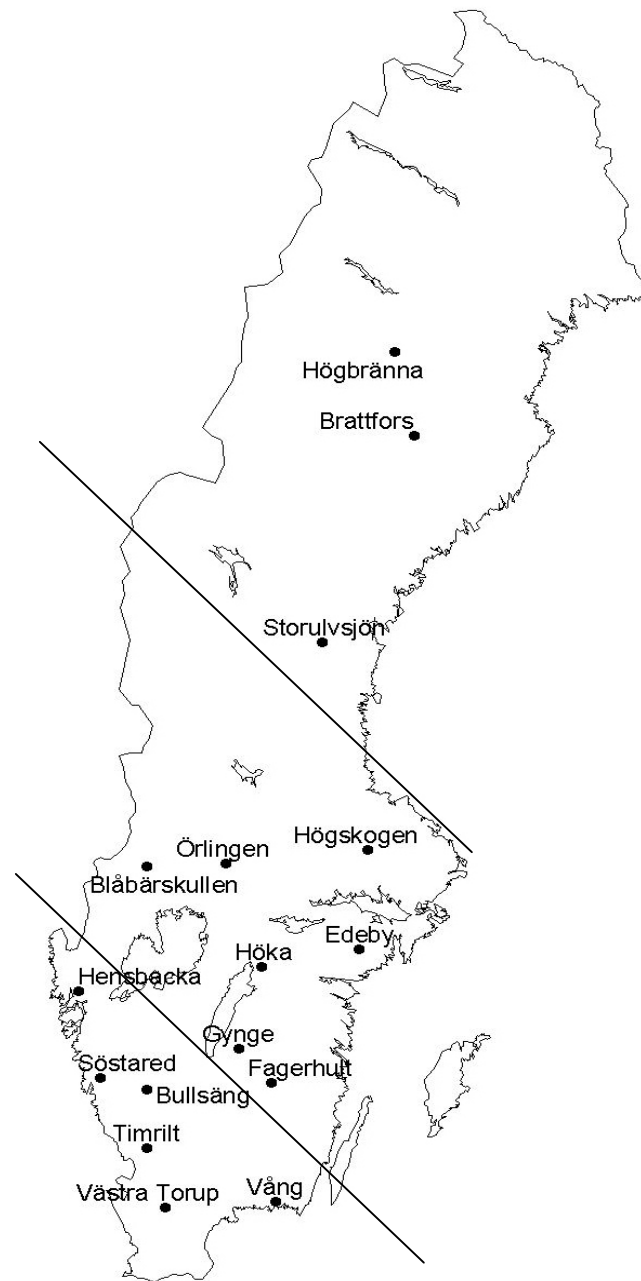


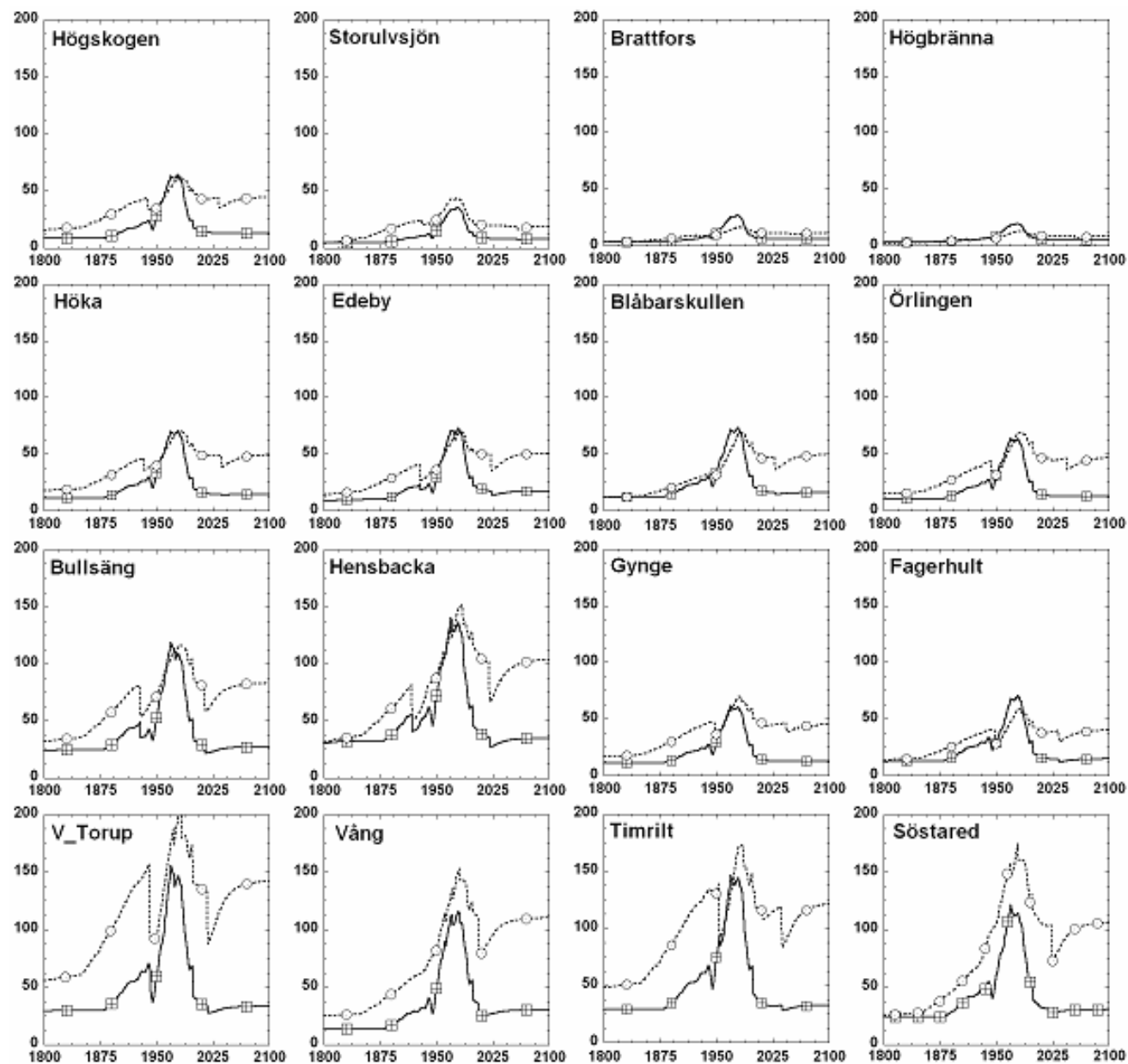




N effects on forest ecosystems

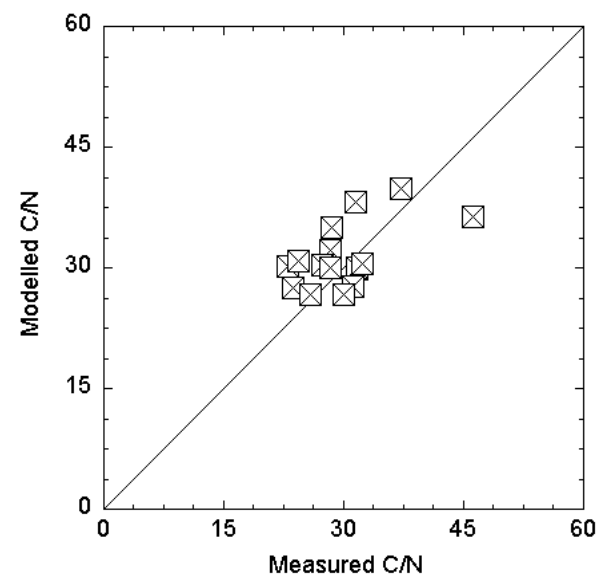
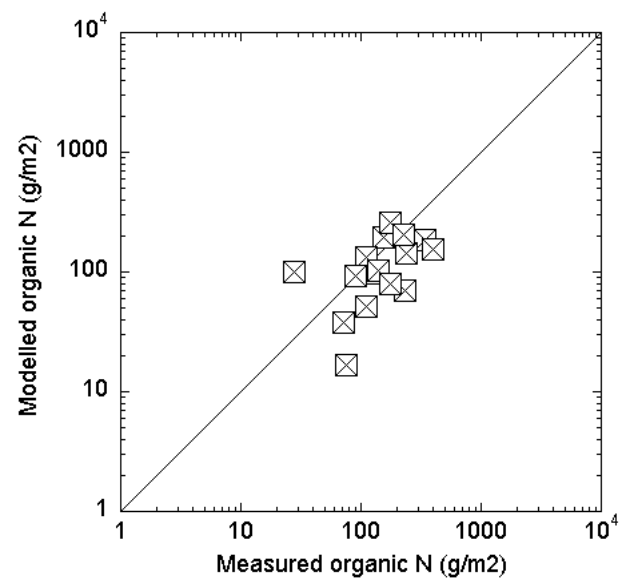
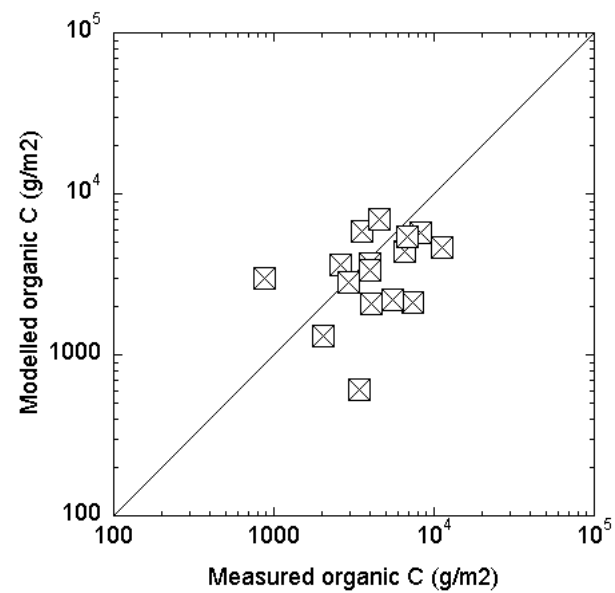
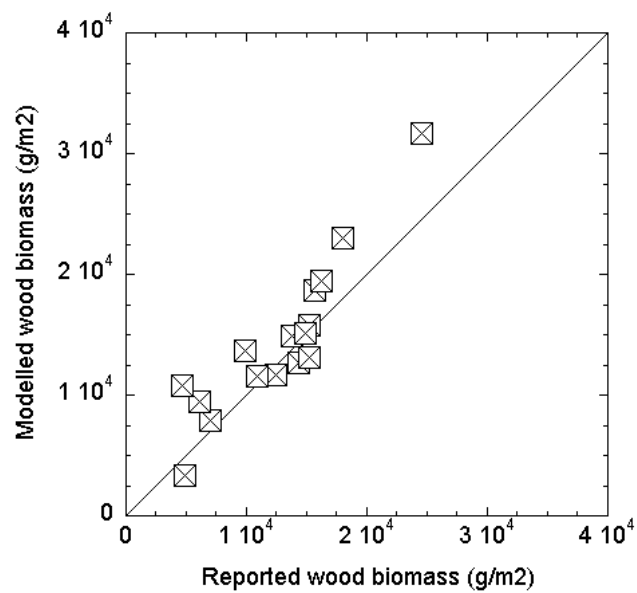
- **Risk for N leaching**
- **Acidification following N deposition**
- **N effect on the ground vegetation composition**

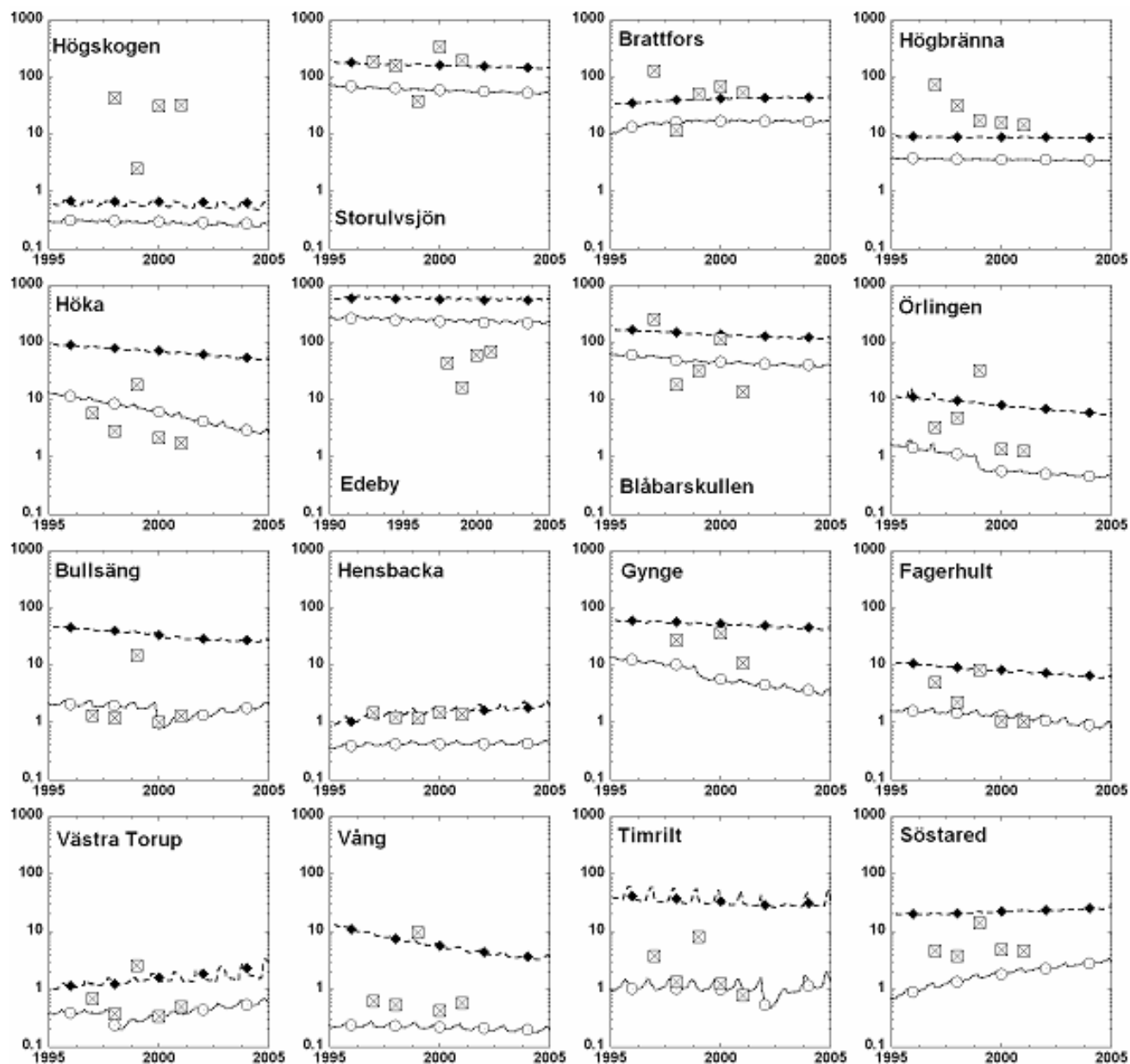




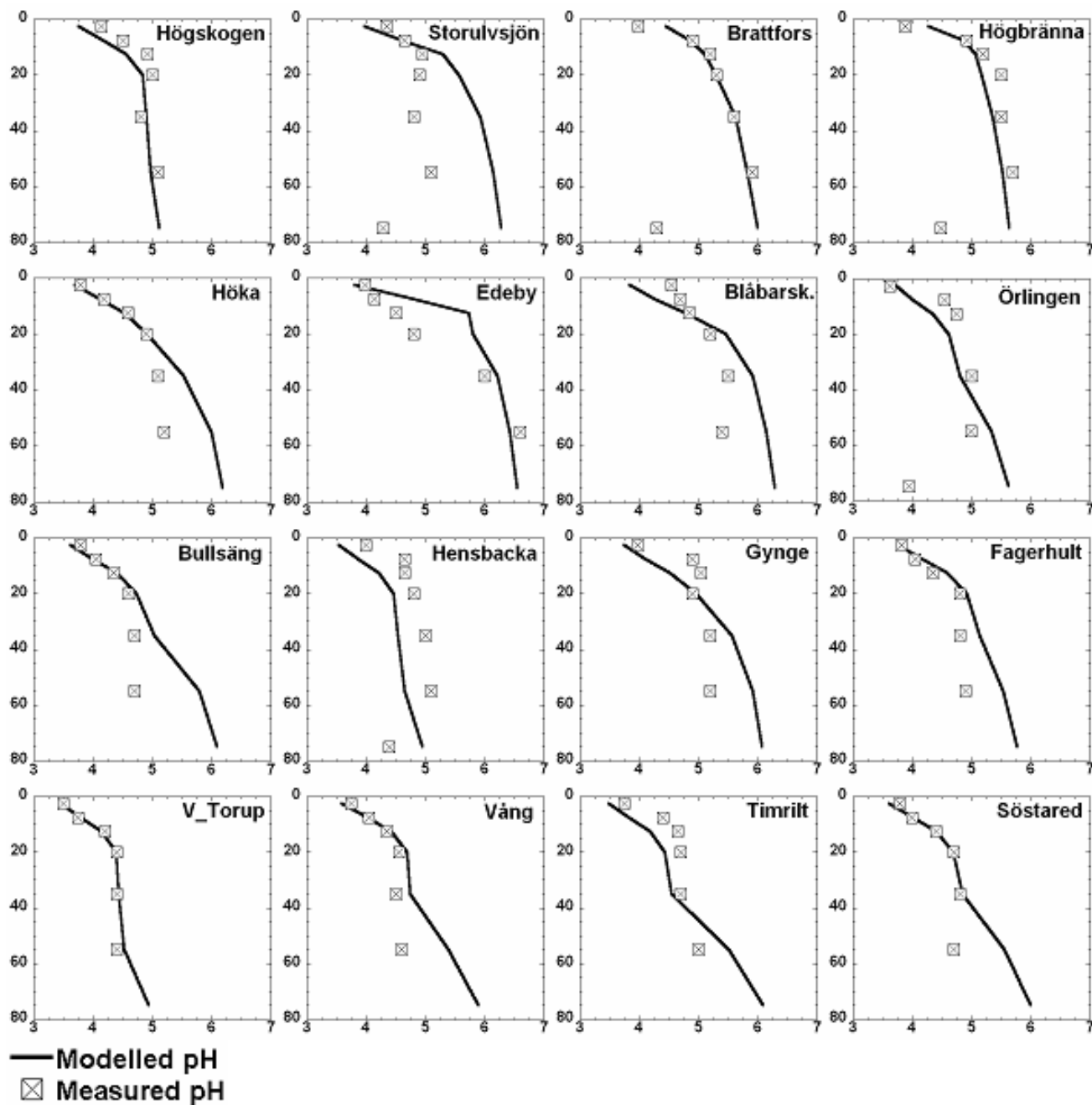
—■— SO_4 ($\text{mmolc/m}^2/\text{a}$)

-○- $\text{NO}_3 + \text{NH}_4$ ($\text{mmolc/m}^2/\text{a}$)

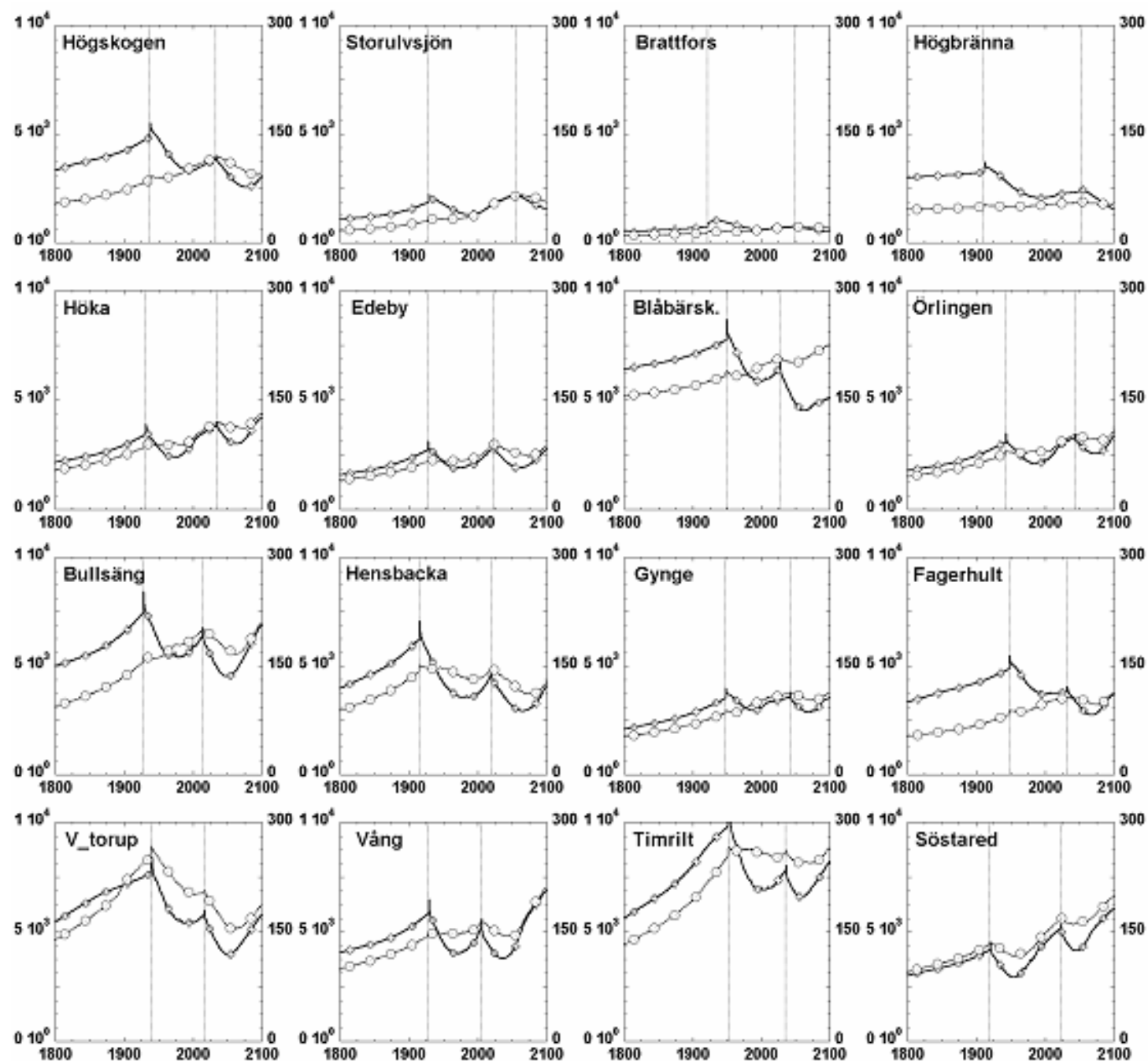




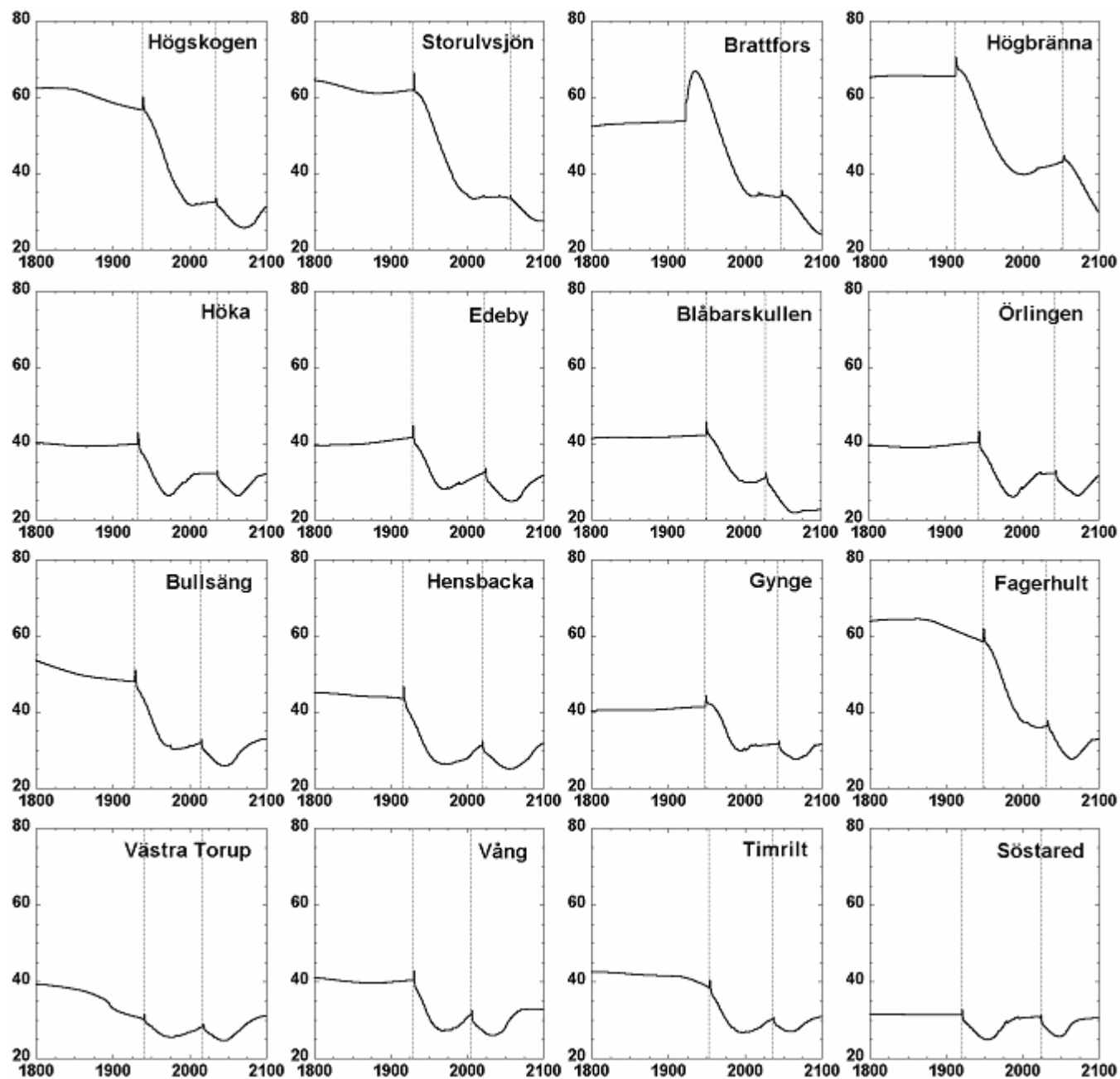
○ Weighted molar BC/Al 25-45cm
 ◆ Weighted molar BC/Al 45-65cm
 ⊠ Measured BC/Al 50cm



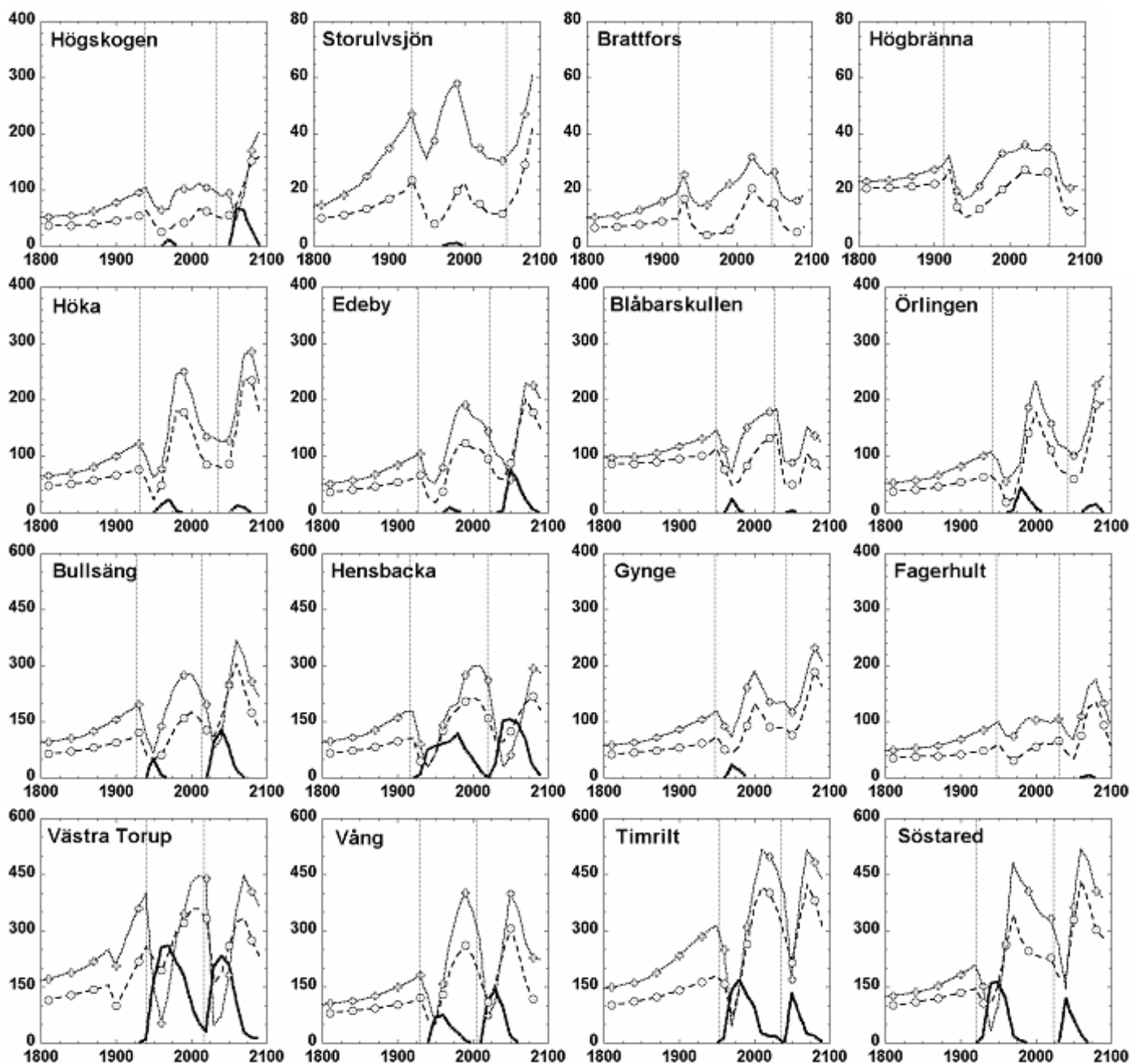
N leaching



○ Soil Organic N in Humus (g/m²) ◇ Soil Organic C in Humus (g/m²)



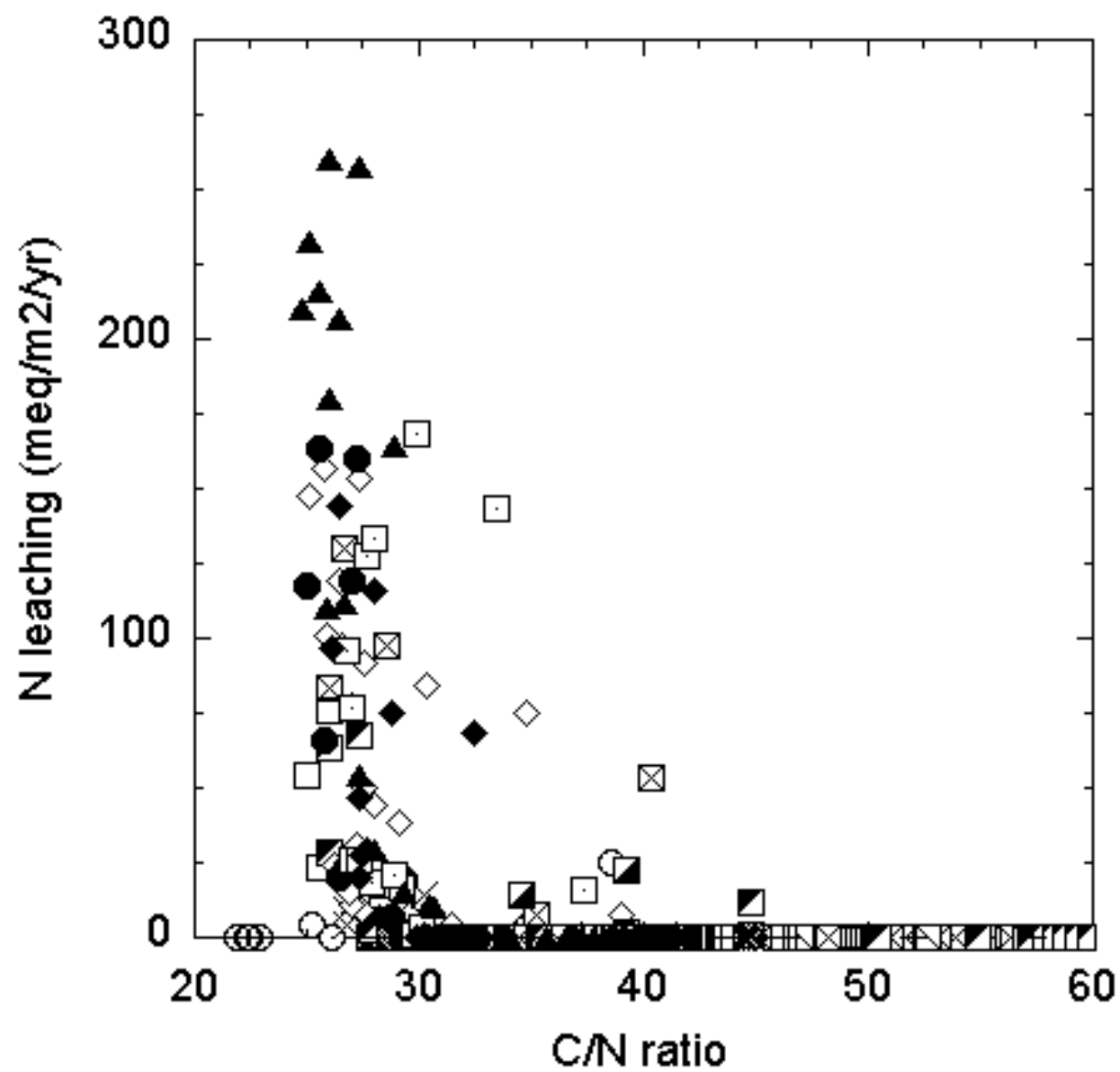
Organic C/N ratio

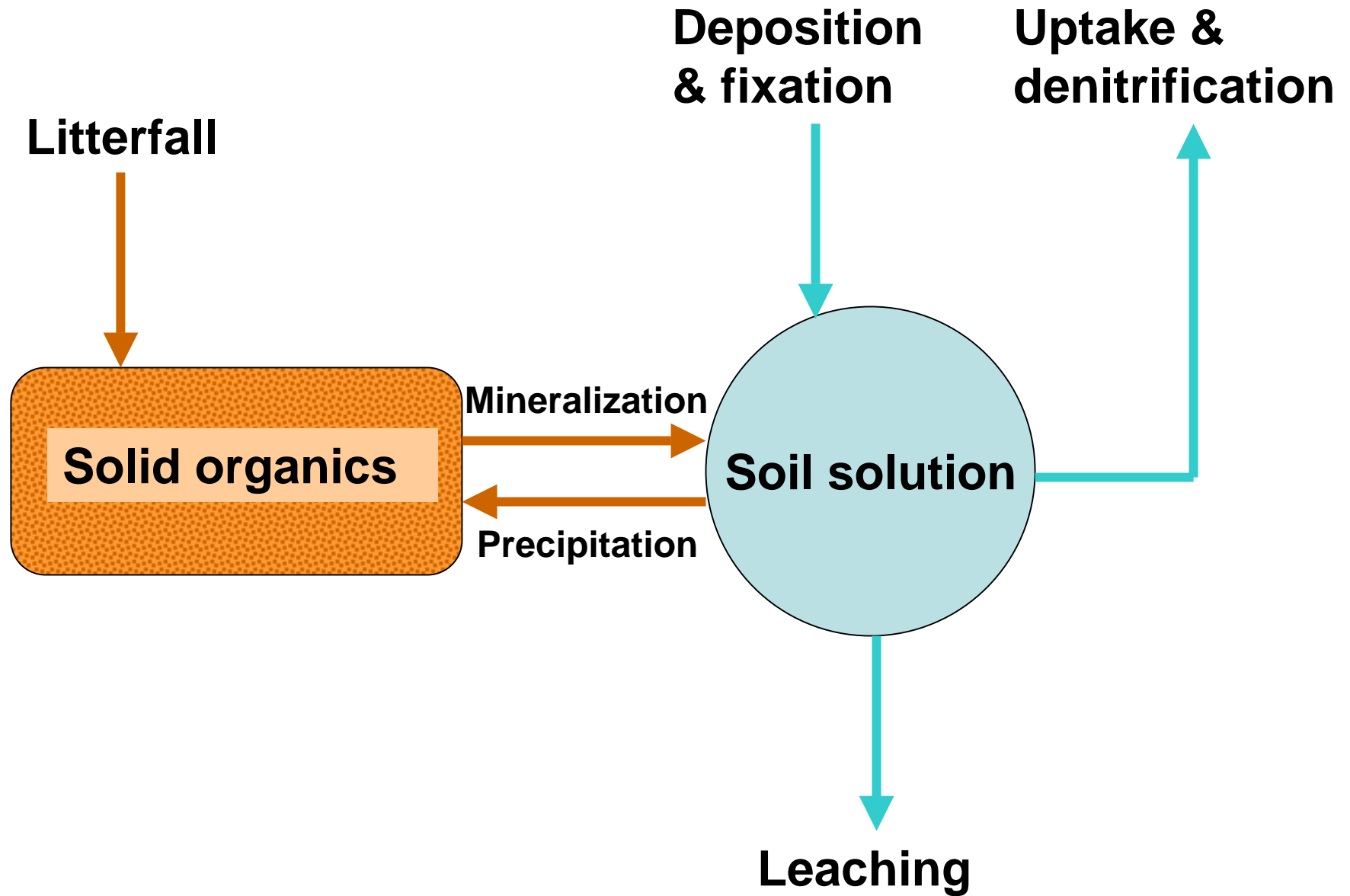


○ N mineralization (meq/m²/yr)

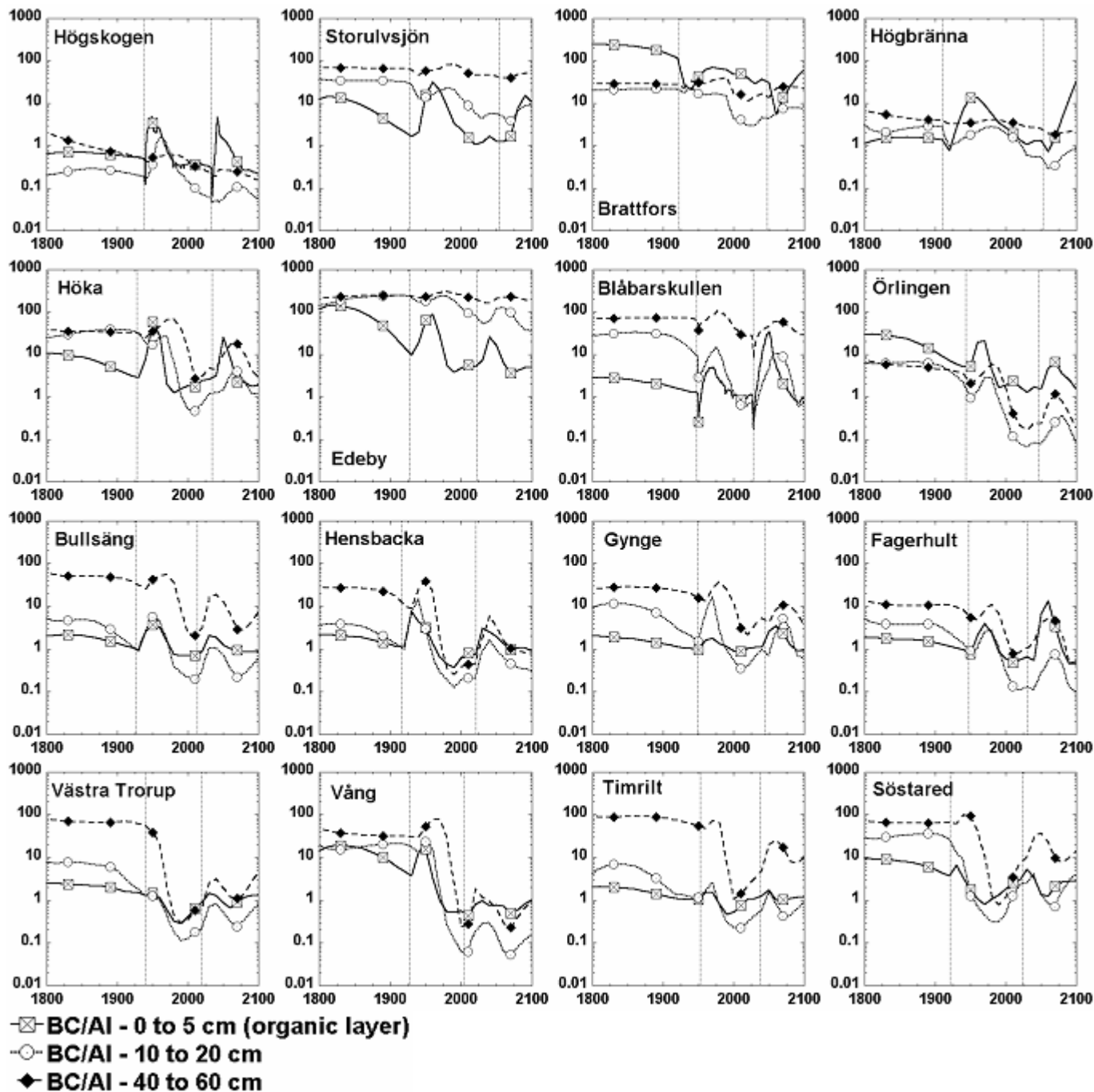
◇ N uptake (meq/m²/yr)

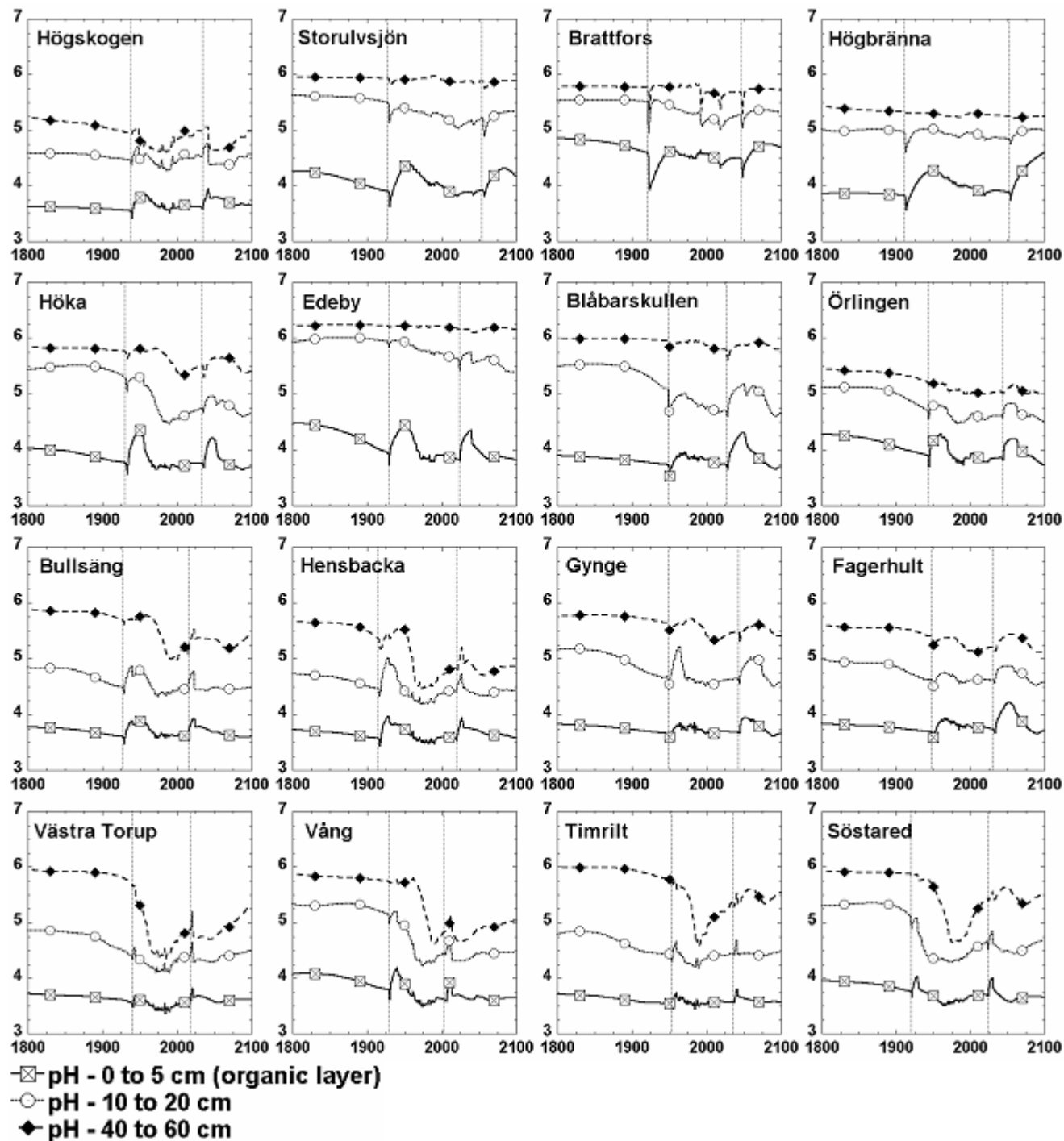
— N leaching (meq/m²/yr)

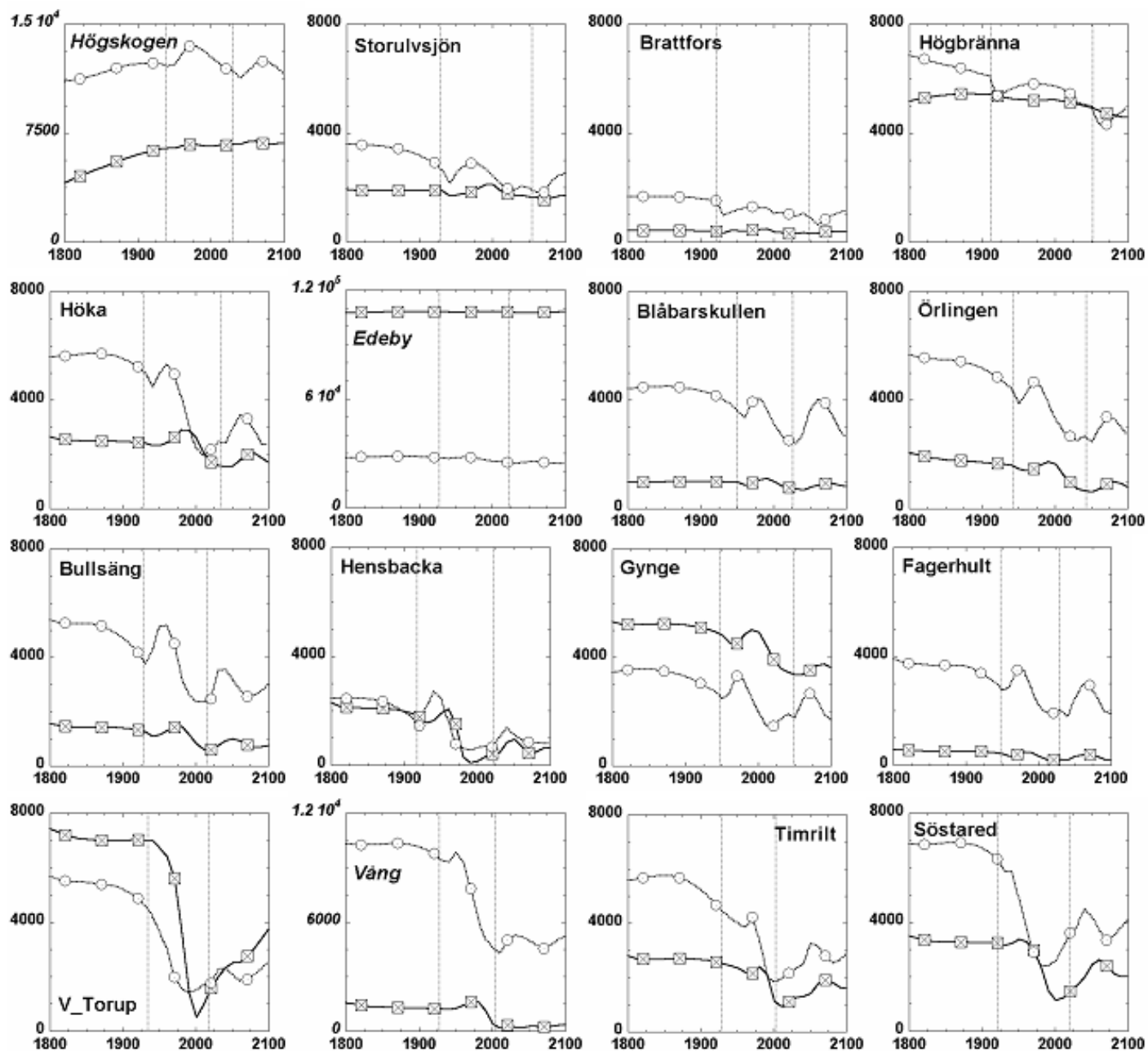




Acidification due to N deposition

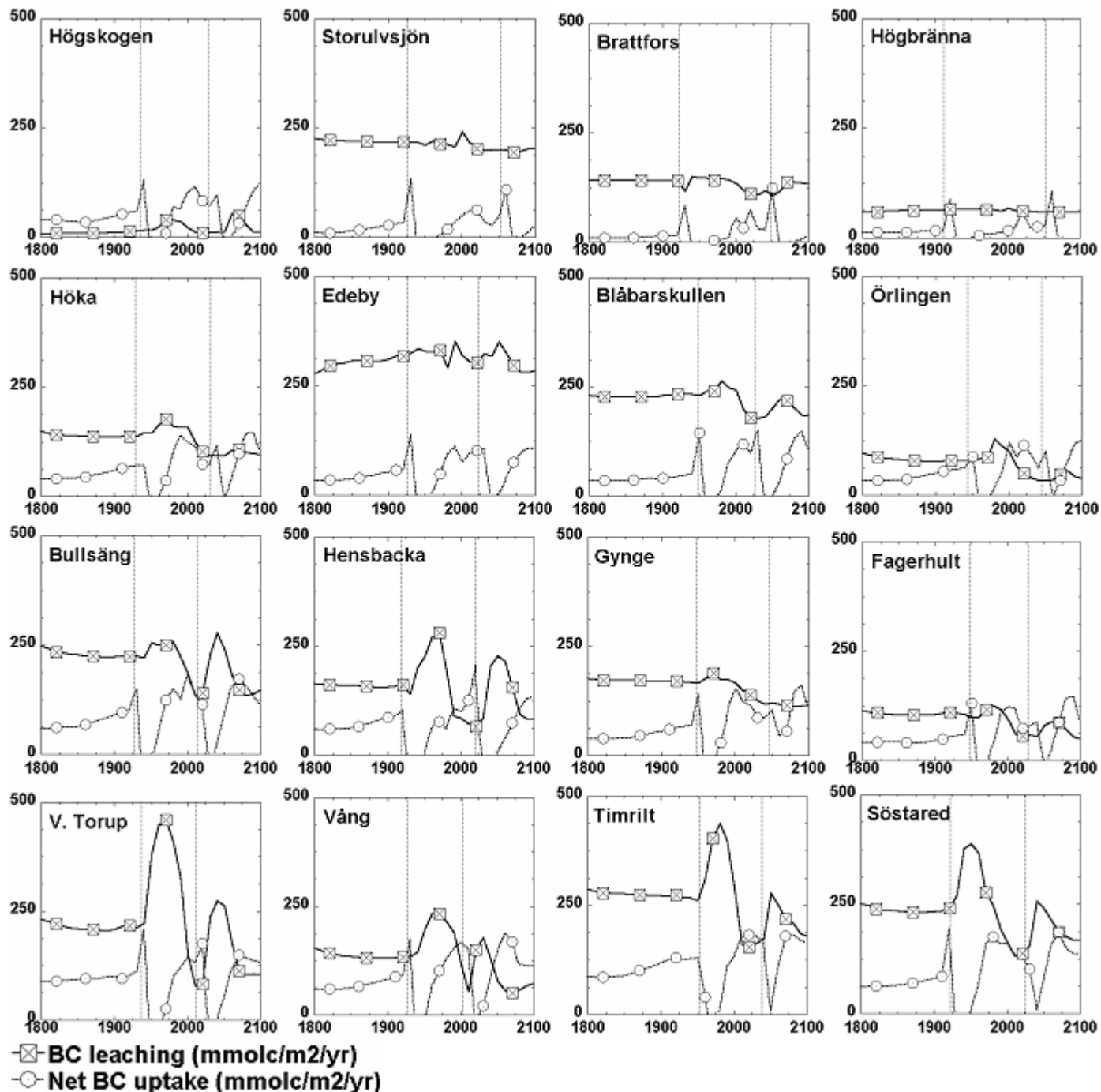


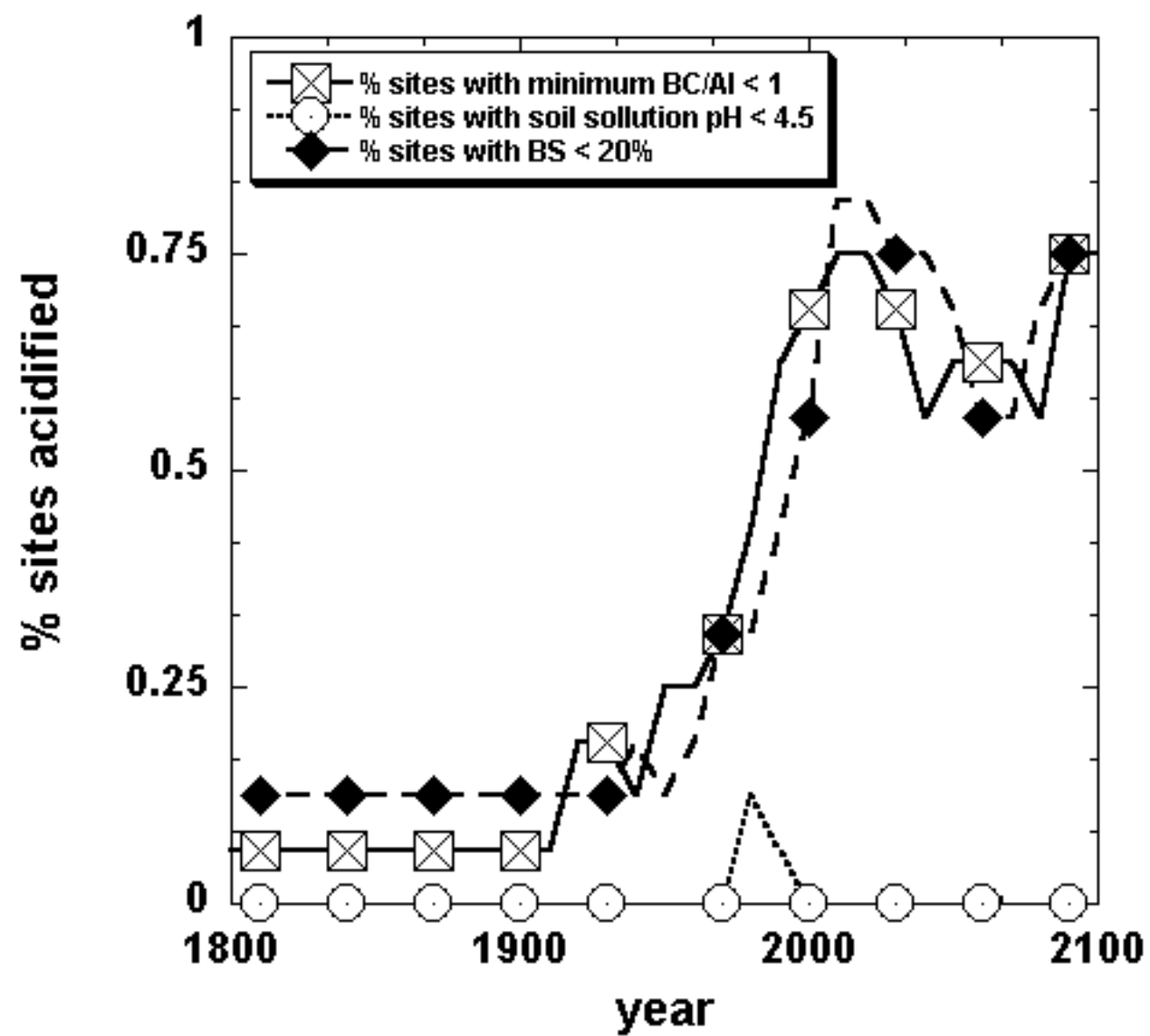


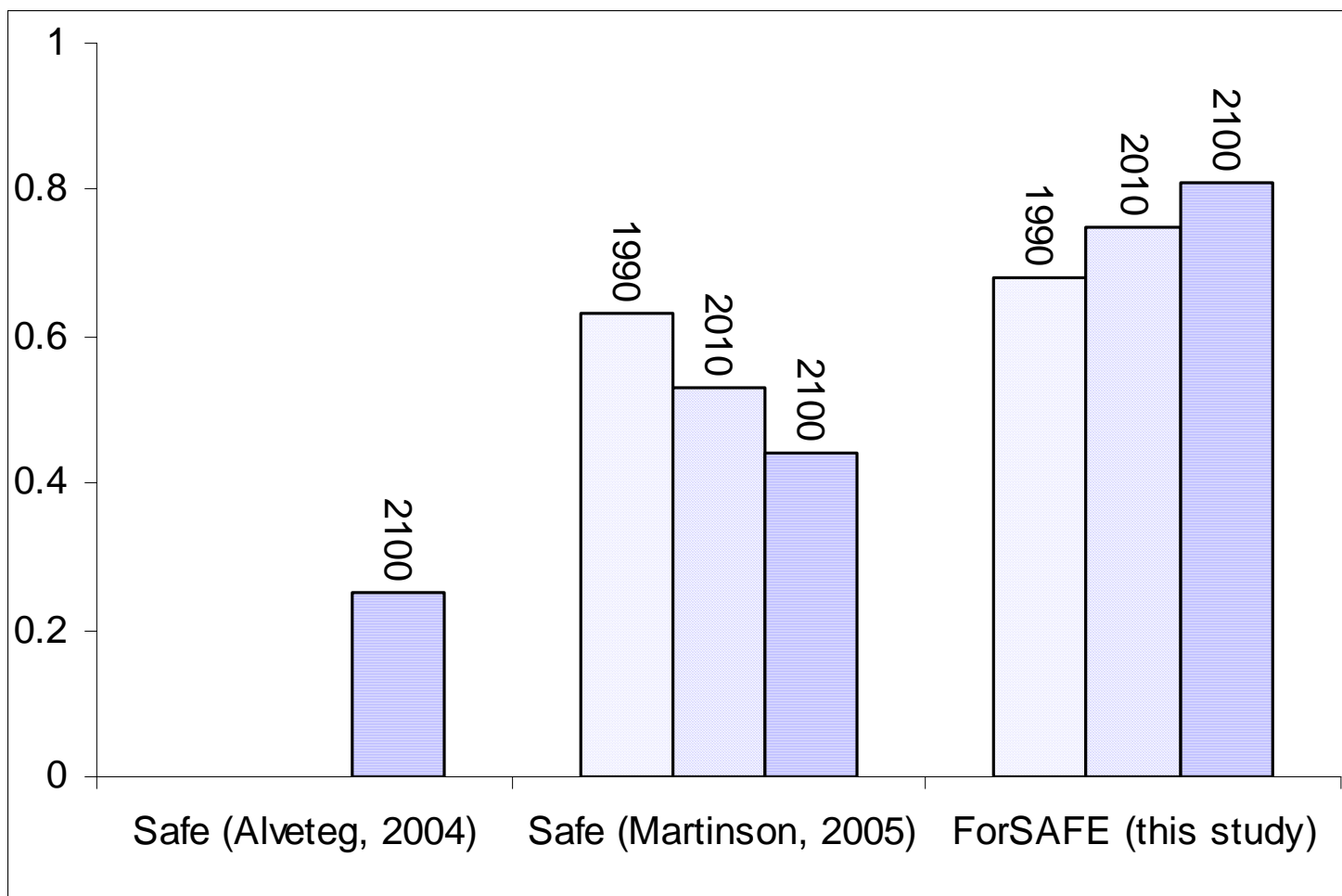


—□— EBC in the deep mineral soil (mmolc/m2)

—○— EBC in the rooting zone (mmolc/m2)



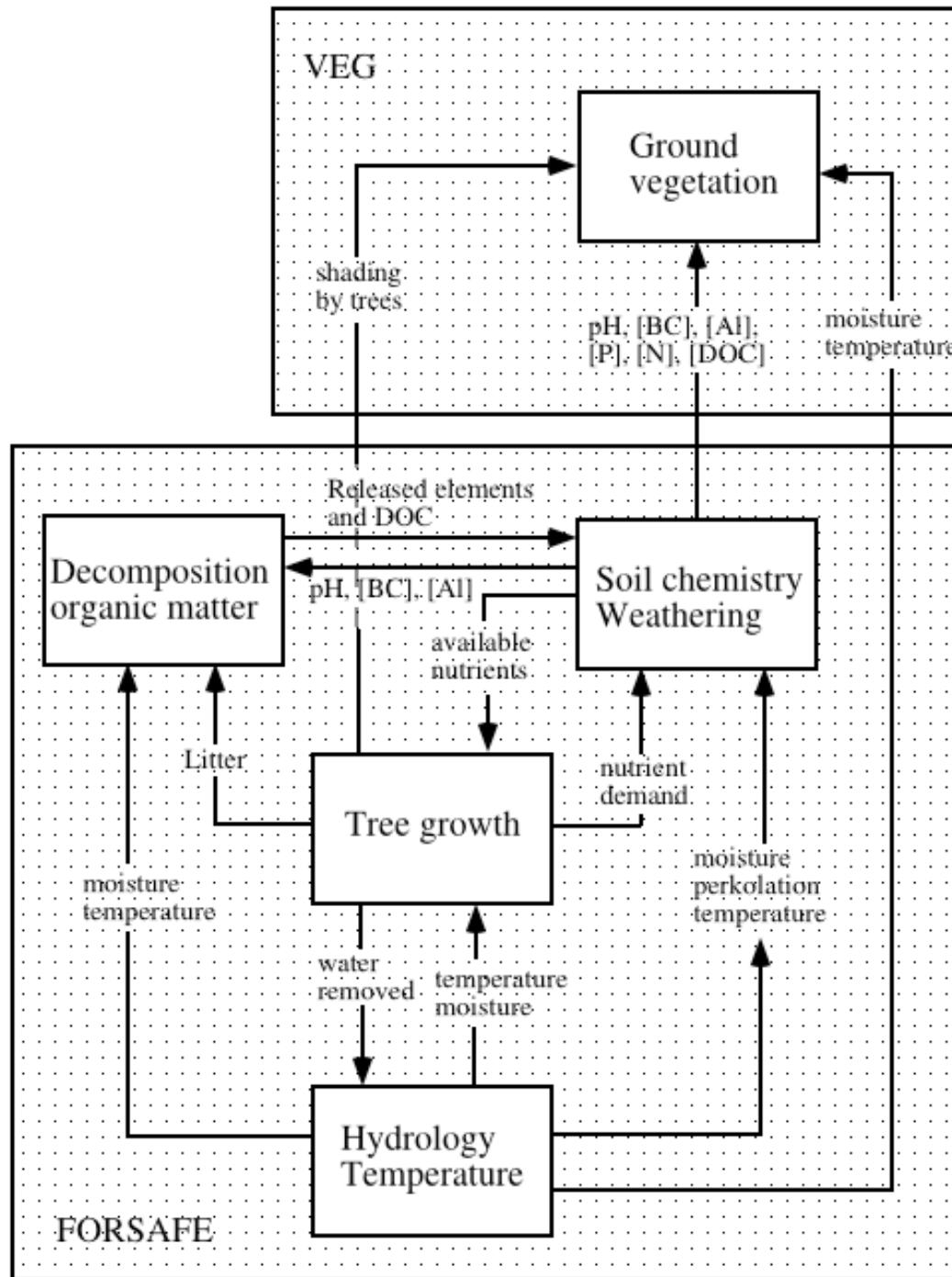




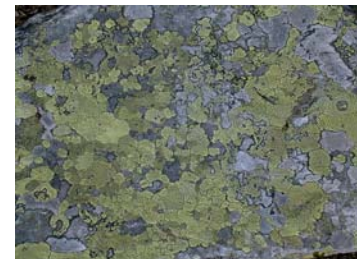
Fractions of predicted acidified sites from three studies (using two different models)

**N effects on the composition of
the ground vegetation**











































ForSAFE_VEG and ForSAFE

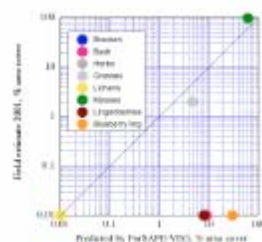
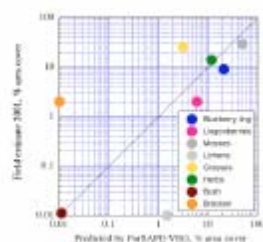
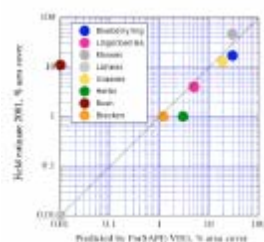
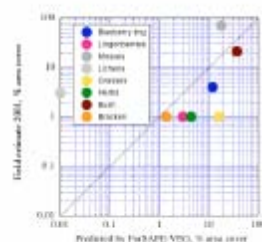
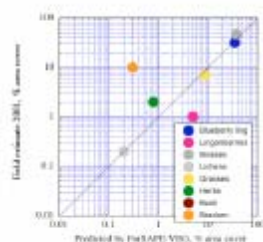
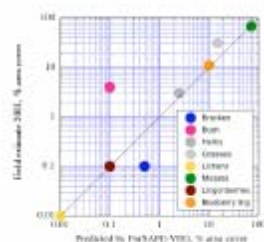
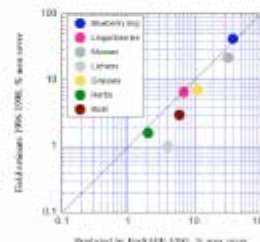
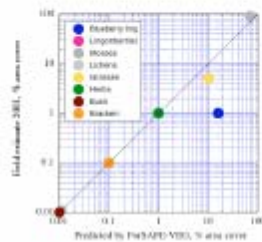
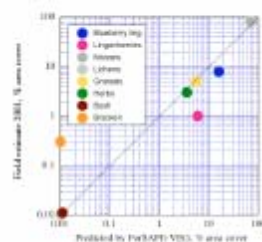
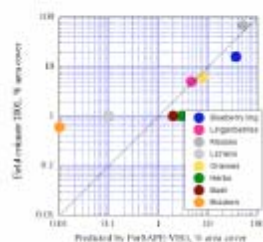
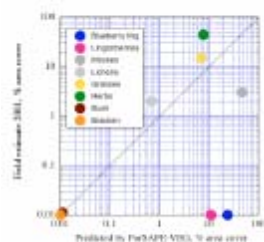
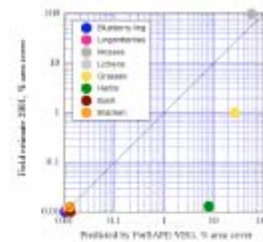
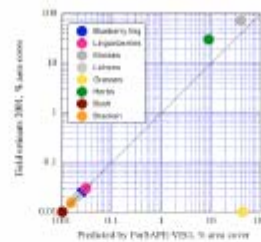
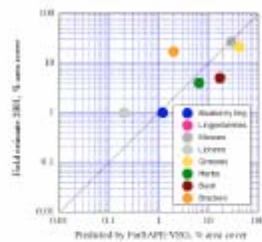
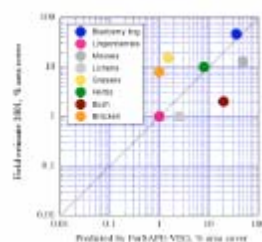
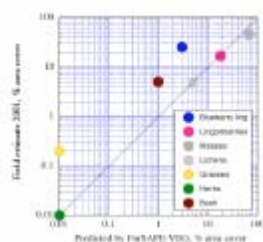
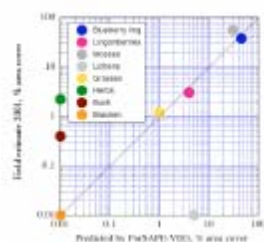


- **Soil acidity**
- **Available soil nutrients (N and BC)**
- **Soil moisture**
- **Site temperature**
- **Light to ground surface**
- **Plant competition strategy**
 - **Shading**
 - **Root distributions**
- **Grazing by animals**

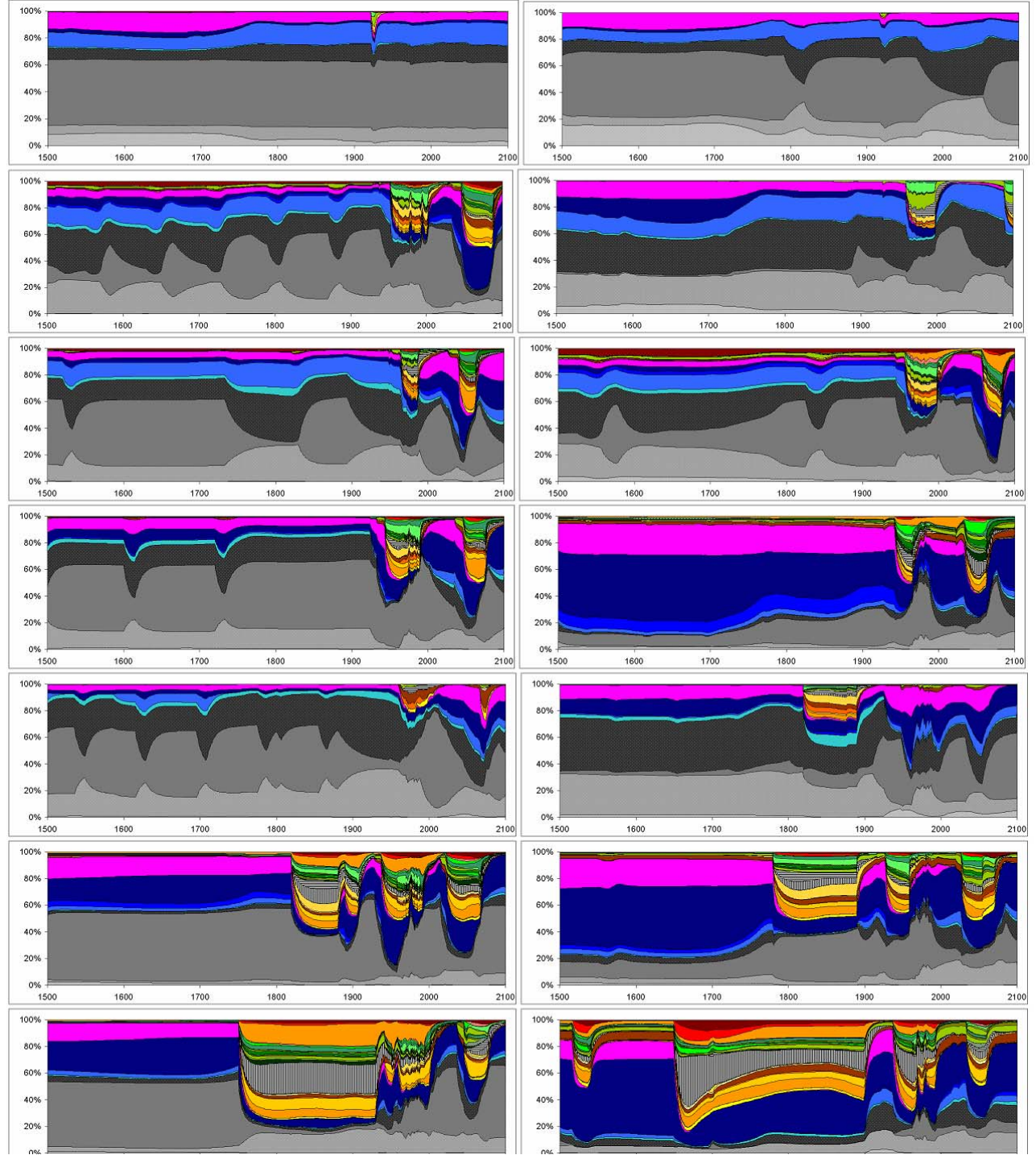


Ground vegetation indicator species used for Sweden

 Cladonia_lichen	 Hylocomium_mosses	 Mnium_mosses	 Sphagnum_moss
 Calluna_vulgaris	 Empetrum_nigrum	 Erica_tetralix	 Vaccinium_myrtillus
 Vaccinium_vitis-idea	 Agrostis_capillaries	 Brachiopodium_pennatum	 Bromus_benekenii
 Calamagrostis_arundinasius	 Deschampsia_cespitosa	 Deschampsia_flexuosa	 Festuca_ovina
 Milium_effusum	 Molinia_caerulea	 Nardus_stricta	 Poa_nemoralis
 Dryopteris_dilatata_coll	 Pteridium	 Aconitum_lycoctonum	 Allium_ursinum
 Anemone_nemorosa	 Antennaria_dockia	 Arnica_montana	 Epilobium_augustifolium
 Galium_odorata	 Geranium_sylvestrum	 Hepatica_nobilis	 Mercurialis_perennis
 Origanum_vulgare	 Oxalis_acetocella	 Trientalis	 Trifolium_repens
 Urtica_dioica	 Myrica_gale	 Rhododendron_toment	 Rubus_idaeus
 Salix_lanata	 Salix_myrsinifolia		



**Changes in the
ground
vegetation
composition
from 1500 to
2100**



Where to from here:

- **Including Phosphorus Dynamics**
- **Separating NH_4 and NO_3**
- **Implications for critical load calculations**
- **Regional implications**