Swedish Throughfall Monitoring Network

Dry deposition to a surrogate surface - The total deposition of inorganic nitrogen and base cations to coniferous forests in Sweden

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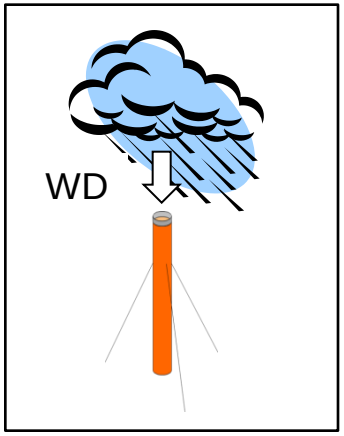
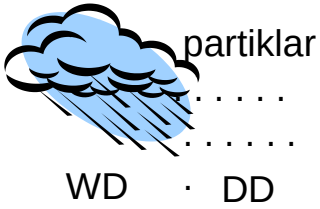
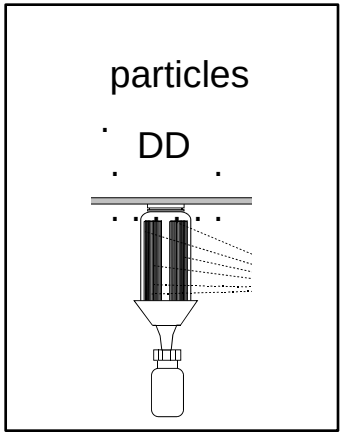
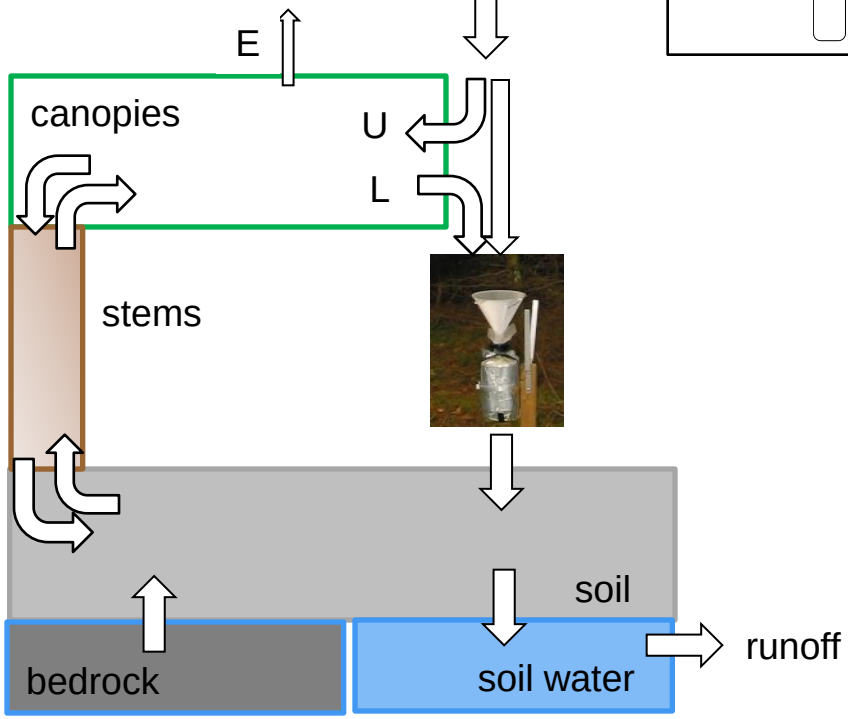
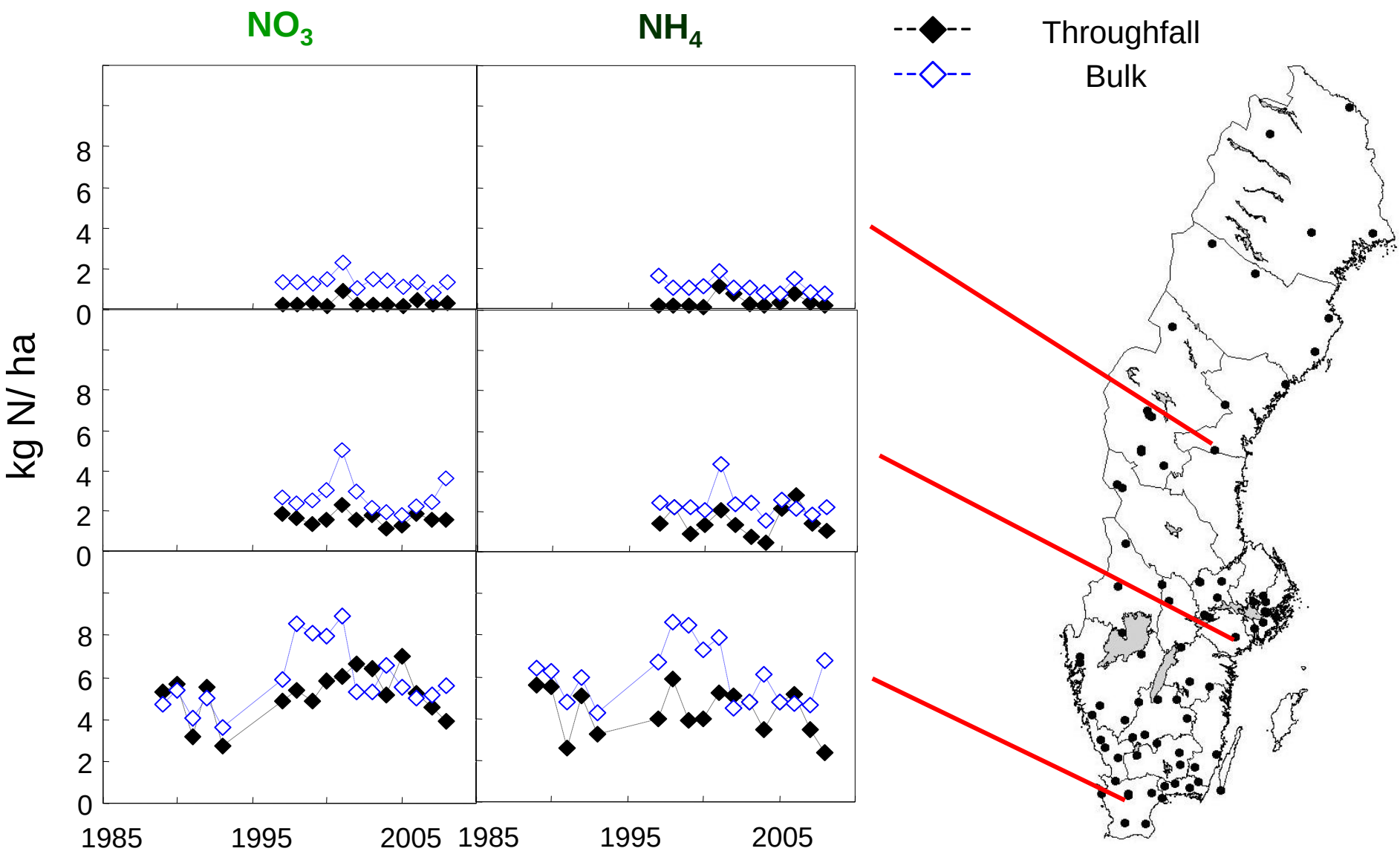
Deposition and internalcirkulation

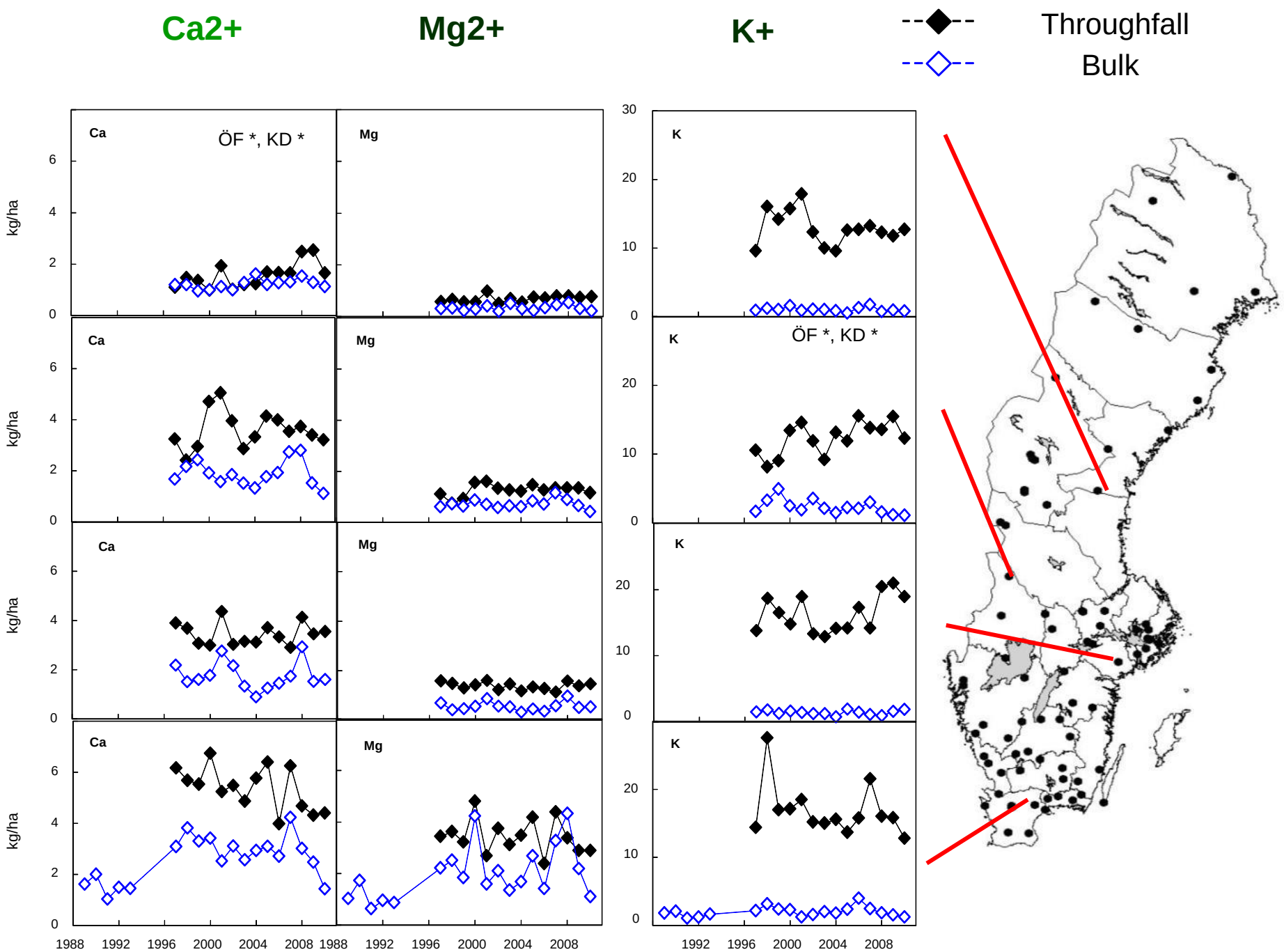









NO3
NH4
Throughfall
Bulk
kg N/ ha
0
2
4
6
8
1985
1995
2005


Ca2+
Mg2+
K+
Throughfall
Bulk
Ca
Mg
K
ÖF *, KD *
kg/ha
0
2
4
6
10
20
30
1988
1992
1996
2000
2004
2008

A "new" method for measuring dry deposition of NO_3/NH_4 to forests

(Ferm & Hultberg, 1999. Atm. Env. 33, 4421)

Based on dry deposition to teflon strings placed under a roof.

Dry deposition of element x:

The net throughfall of sodium to the forest

multiplied by

The ratio between concentrations of element x and sodium in the sample from the surrogate surface.

Monthly sampling 2001 (2003) – 2008 (2007) at 12 sites across Sweden near Norway spruce forests.

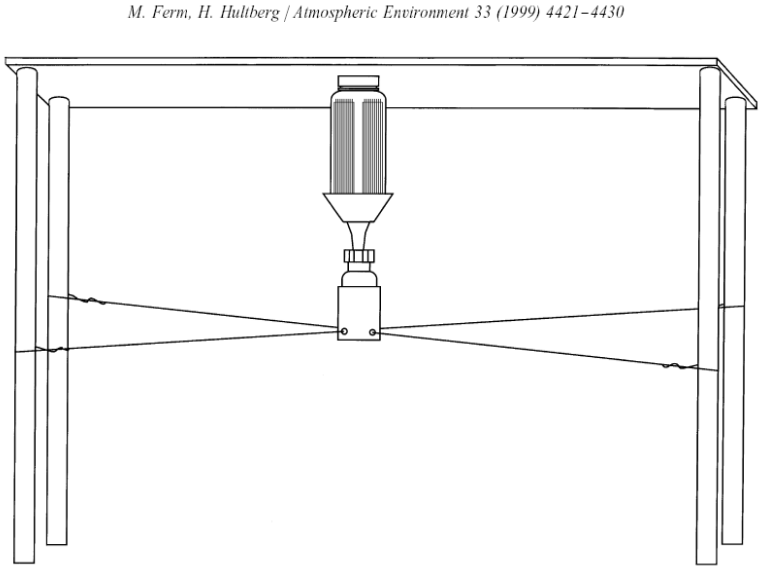
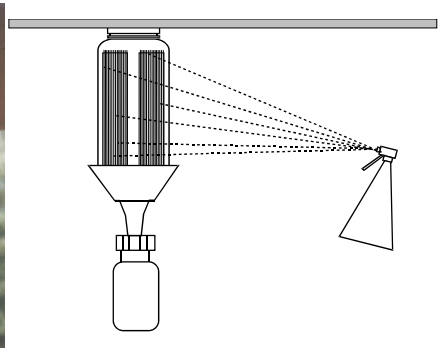


Fig. 2. The surrogate surface that is simple to produce mounted under a roof.



Dry deposition of NO3/NH4

(Ferm & Hultberg, 1999. Atm. Env. 33, 4421)

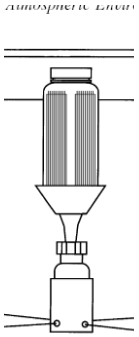
Sampling mainly particle-bound elements.

Main assumptions:

$[x]_{string} = [x]_{canopy}$; $[Na]_{string} = [Na]_{canopy}$

$v_{x,string} / v_{Na,string} = v_{x,canopy} / v_{Na,canopy}$

$[x]_{string}$; $[Na]_{string}$



$[x]_{canopy}$; [$[Na]_{canopy}$

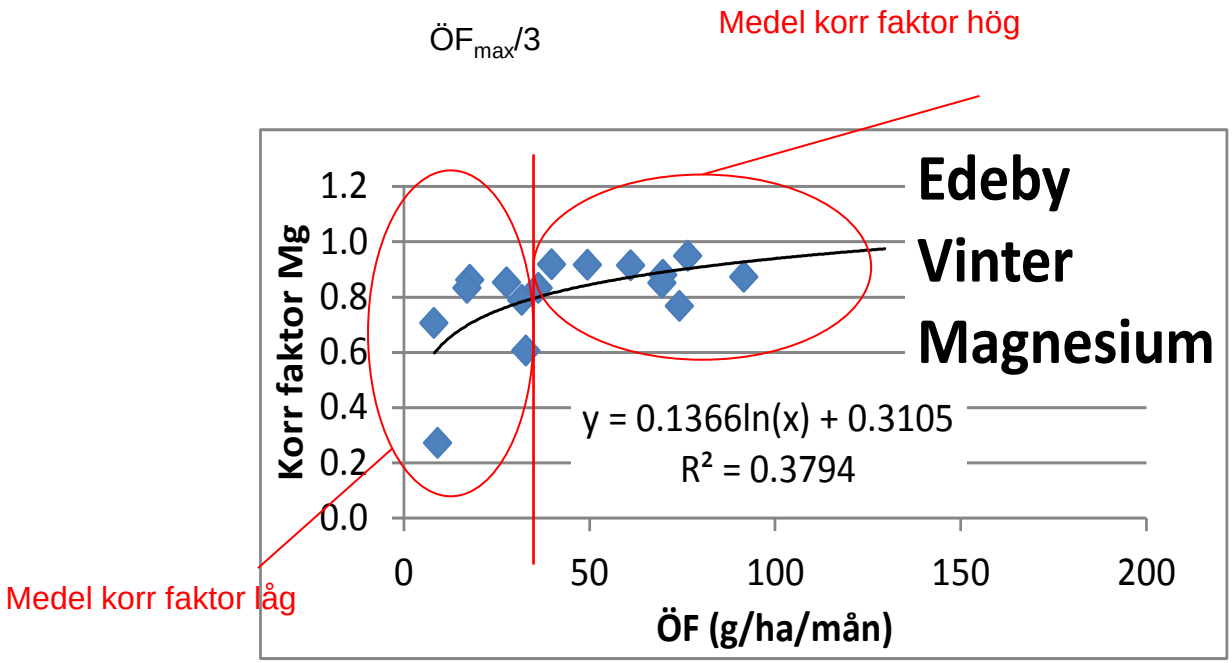
Correction for dry deposition to bulk samplers

(Hellsten & Westling, 2006)

Correction factor = 1-(TUT/ÖF).

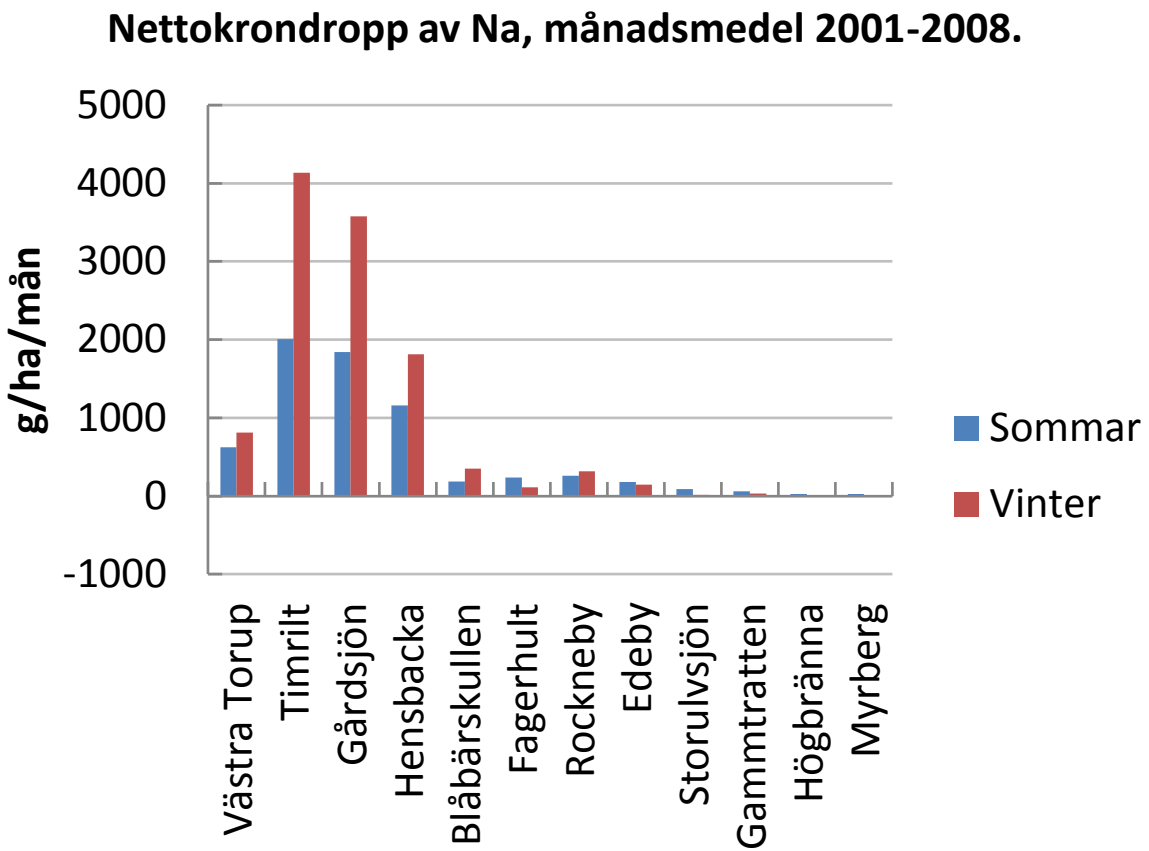
TUT, sampler under a root
ÖF, bulk deposition open field

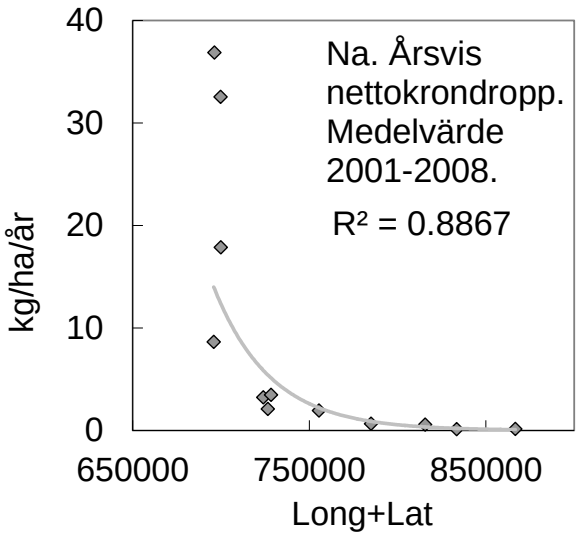
Monthly data Mar 2001 - Sept 2004



Net throughfall of sodium

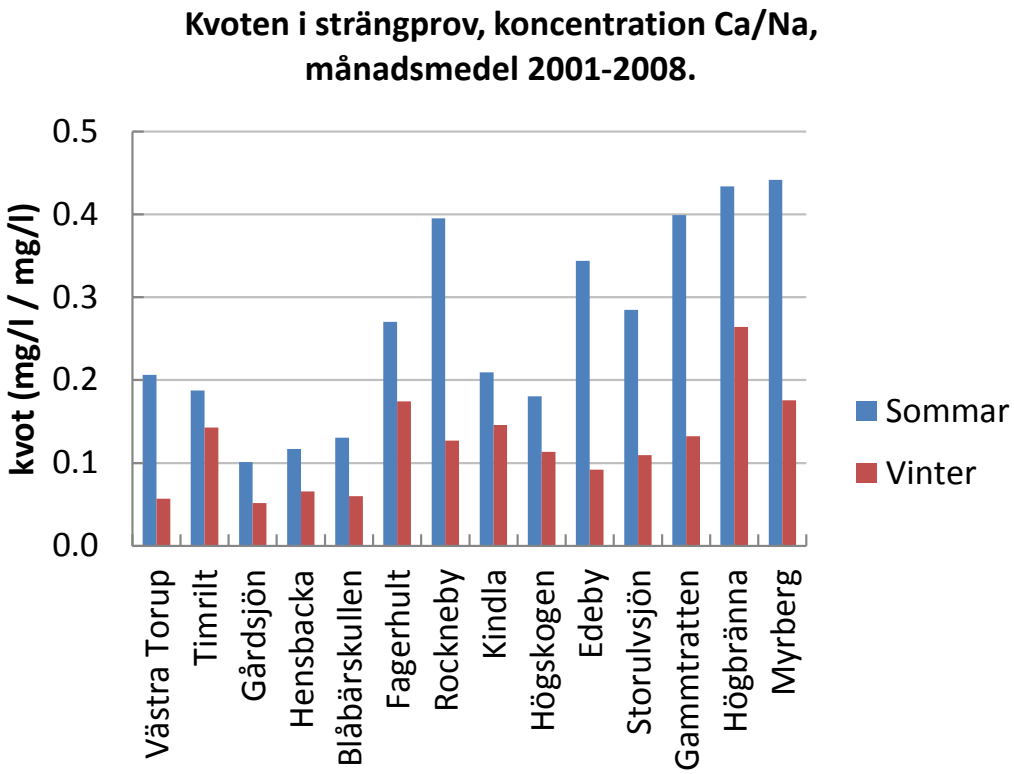
g Na/ ha/ month

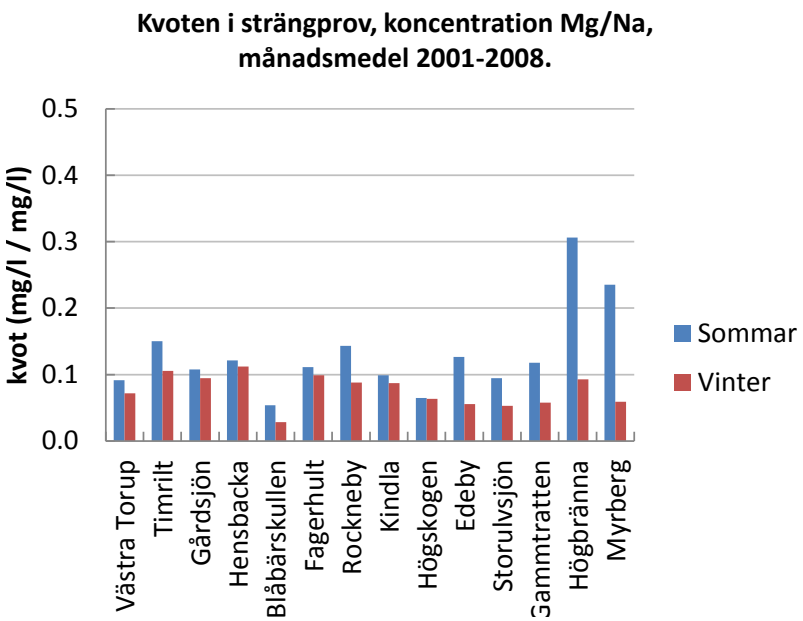


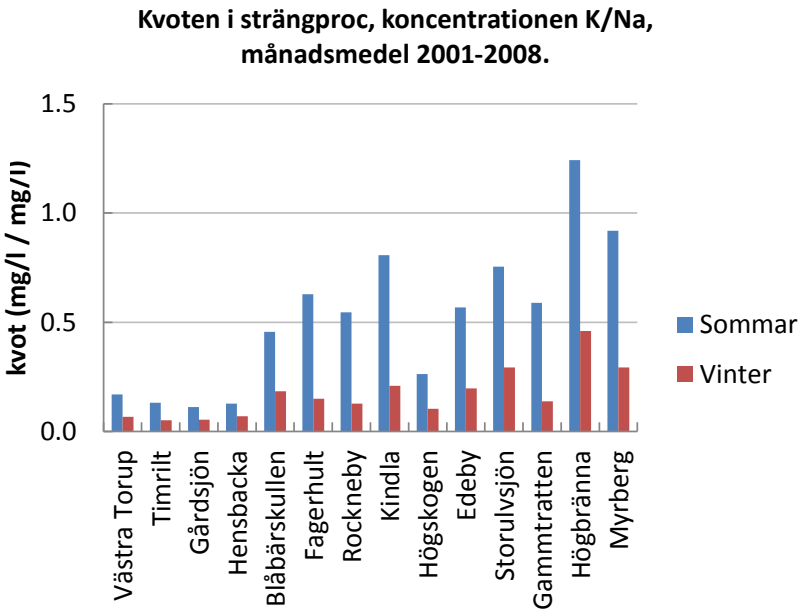


Medelvärden (A) och standardavvikelse (B) för månadsvis nettokrondropp (krondropp – våtdeposition) av Na+ för olika mätplatser inom Krondroppsnätet, beräknat från månadsvisa mätningar 2001-2008, uppdelat på sommar- och vinterhalvår. Dessutom visas beräknat årsvisa värden för nettokrondropp av Na+ för olika platser plottat mot ett geografiskt index bestående av summan av latitud och longitud (C). Detta index ökar från sydväst mot nordost. Mätplatserna är ordnade från vänster till höger i relation till geografisk position från sydväst mot nordost. De tre högsta värdena gäller platser på västkusten (Timrilt, Gårdsjön, Hensbacka).

Strängprov – kvoten mellan ämne x och natrium

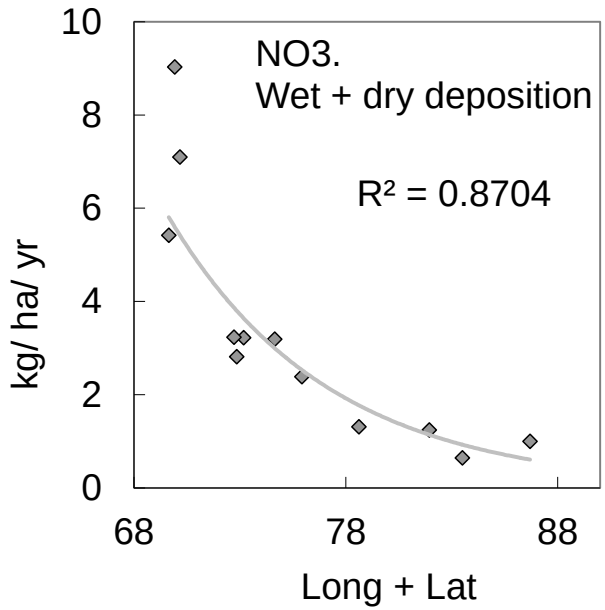


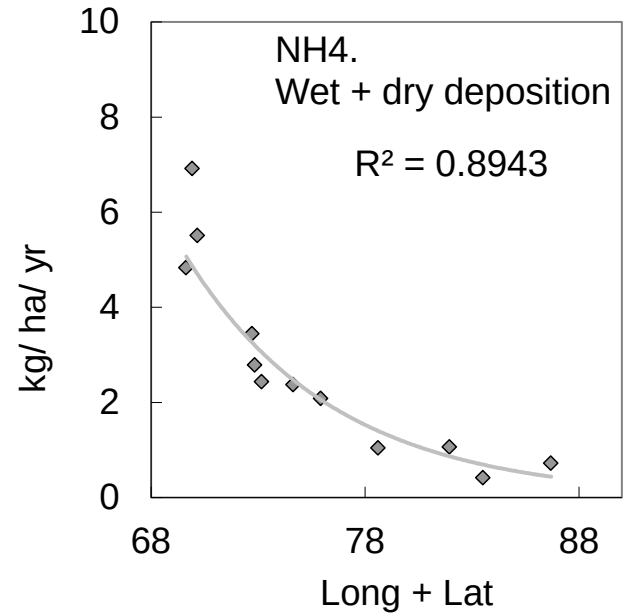


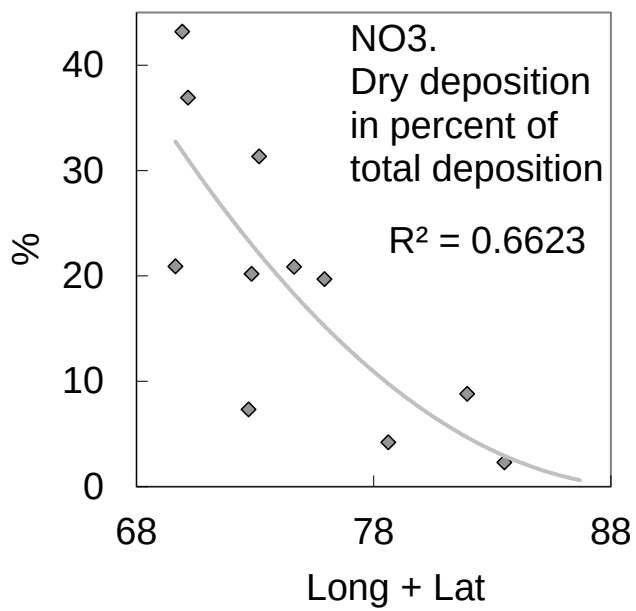


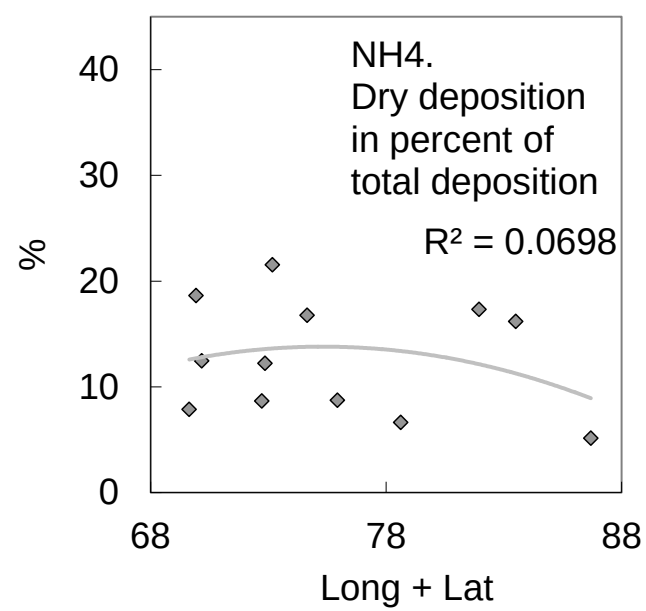
Kvoterna mellan koncentrationer av respektive ämnen i provet från **strängprovtagarna** i relation till motsvarande koncentrationer av Na+ för olika mätplatser. Kvoterna är baserade på koncentrationer med enheten mg av ämnet per liter för de olika ämnena (Ca, Mg eller K) och beräknade från månadsvisa mätningar 2001-2008, uppdelat i sommar och vinterhalvår.
Dataserierna för Kindla och Högskogen är avsevärt kortare än övriga.
Mätplatserna är ordnade från väster till högre i relation till geografisk position från sydväst mot nordost.

Nitrogen deposition decreasing towards north-east



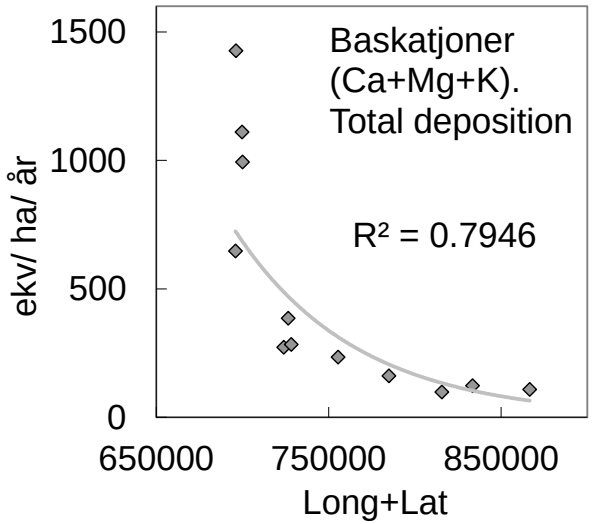


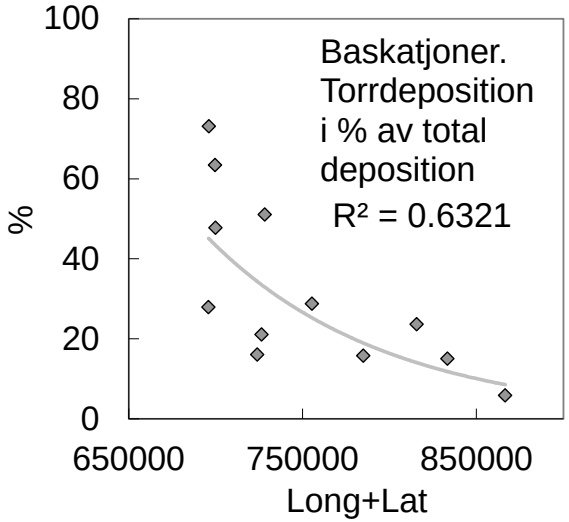


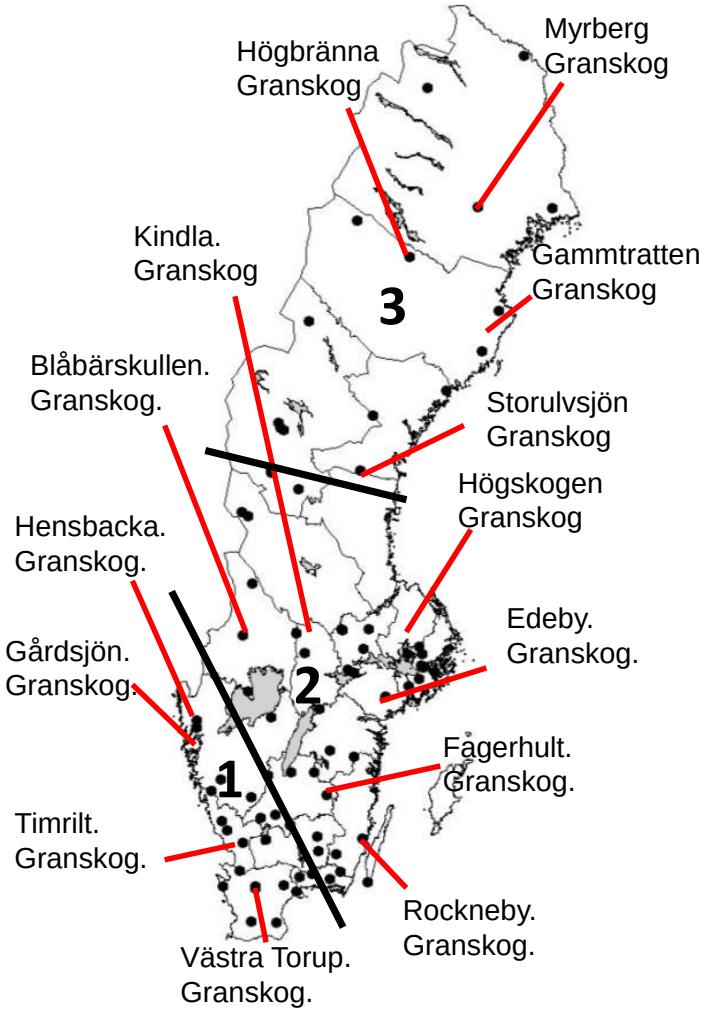


Deposition av baskatjoner

Årsvis medelvärden för perioden, ekv/ha/år



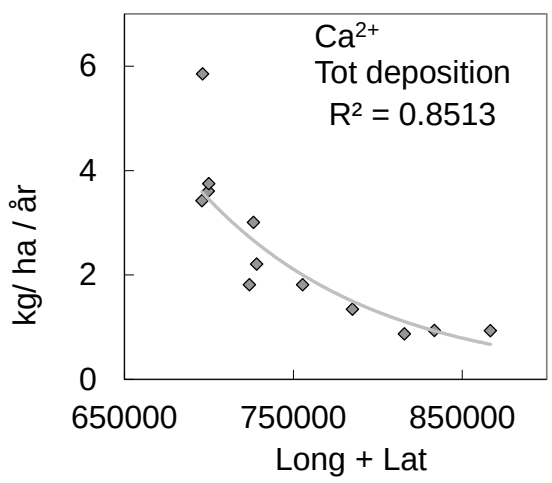


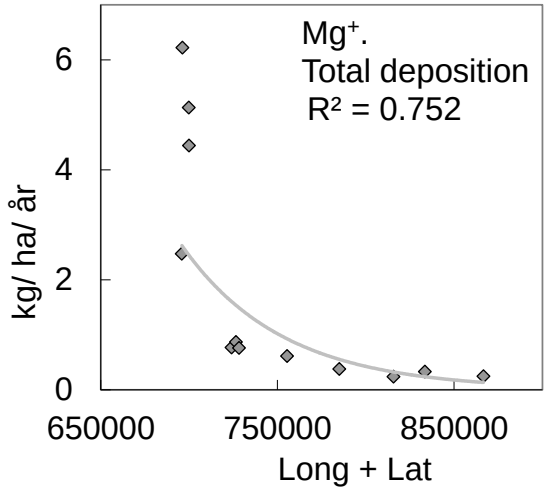


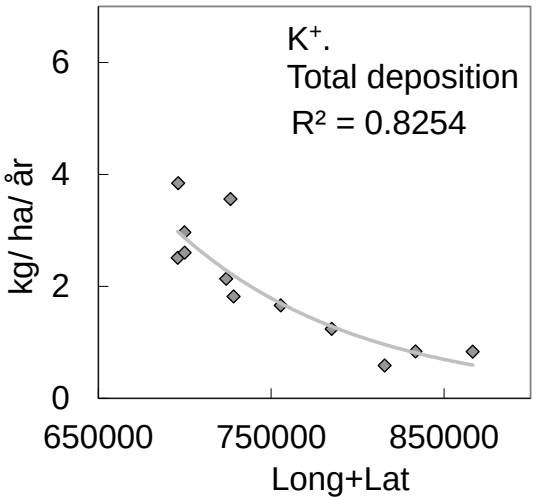
Årsvisa värden för depositionen av baskatjoner (Ca, Mg, K). Medelvärde för hela perioden 2001-2008.
Samband mellan nedfall av baskatjoner och geografisk position för de 14 lokalerna. Position definierades som summan av latitud och longitud, vars värde avtar mot nordost.

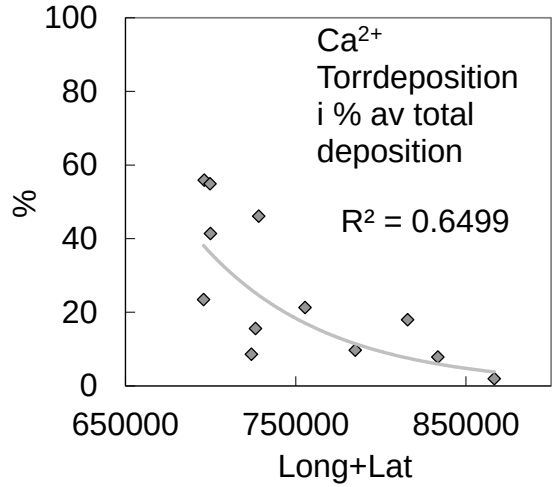
Deposition av Ca^{2+} Mg^{2+}, K^{+}

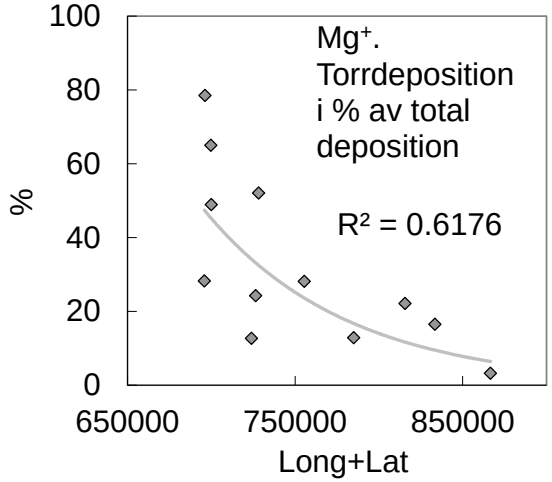
Årsvis medelvärden för perioden, kg/ha/år

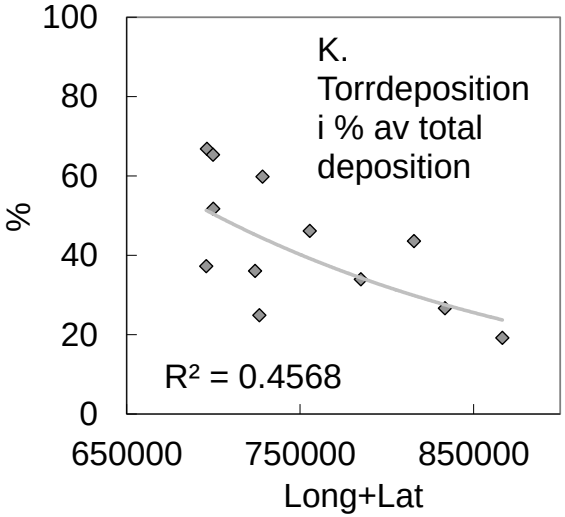




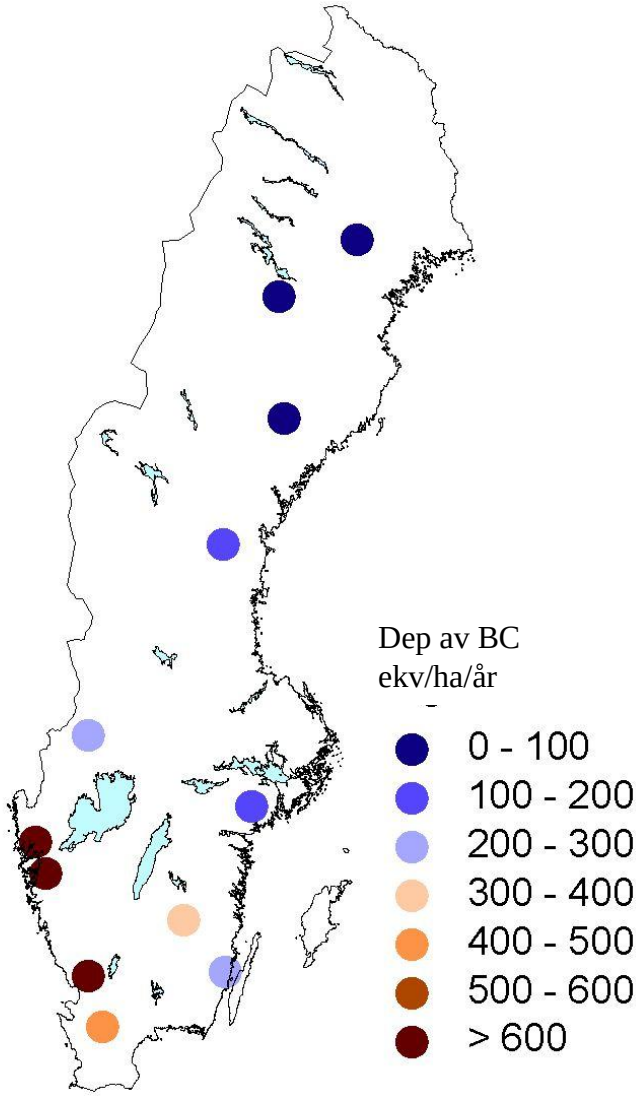




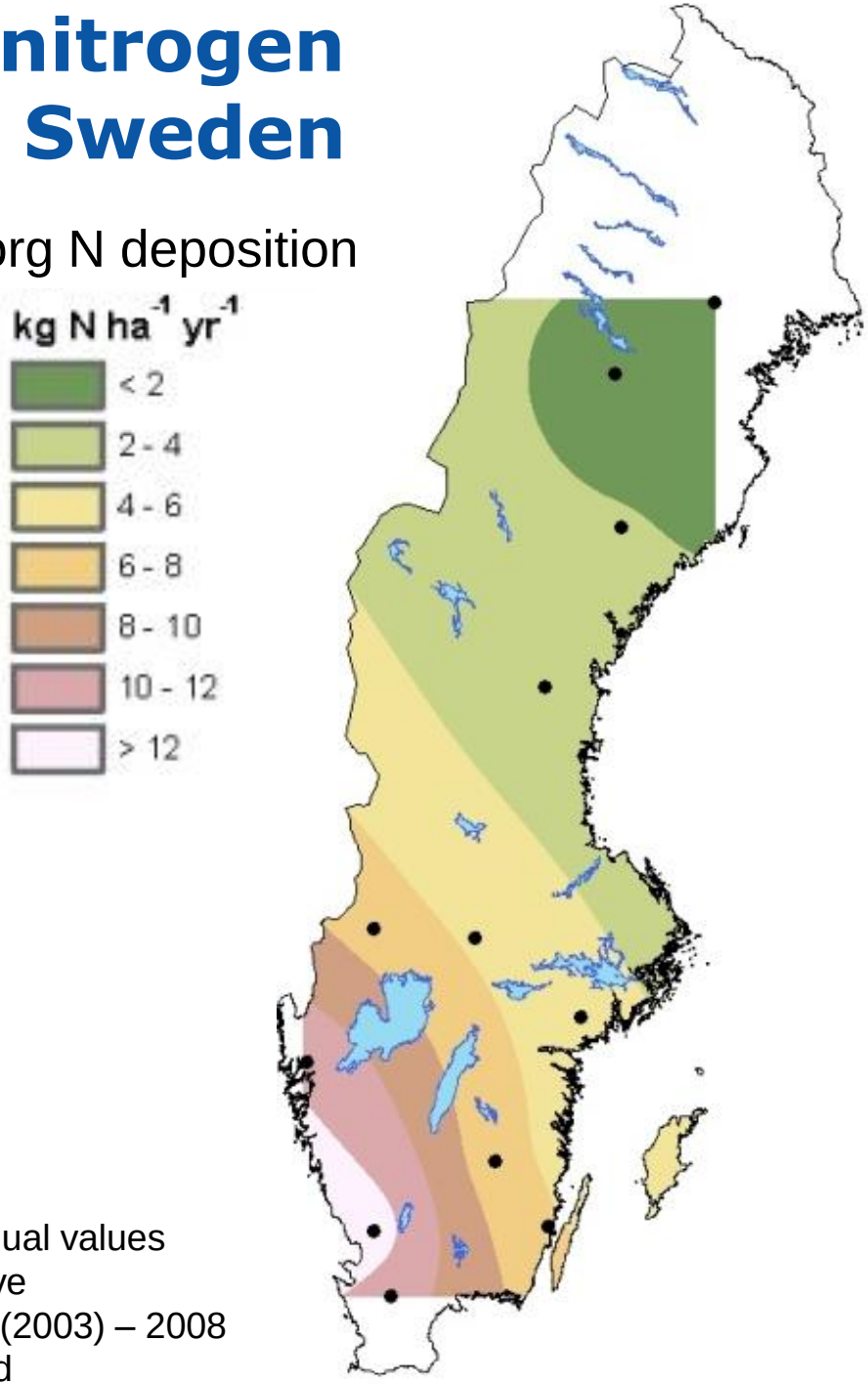




Deposition of inorganic nitrogen and base cations across Sweden

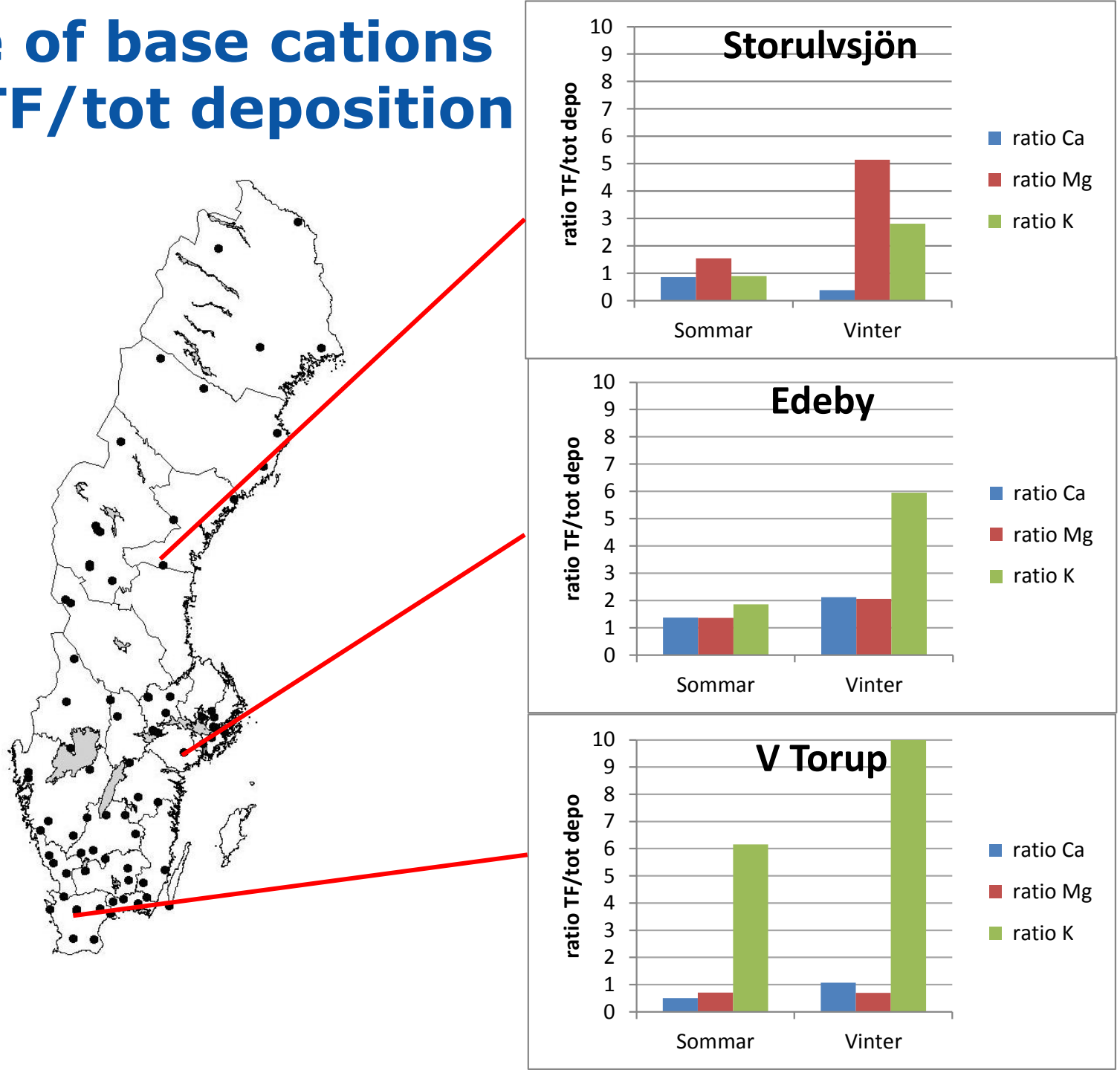


Inorg N deposition



Average annual values representative
for the 2001 (2003) – 2008 (2007) period

Leakage of base cations – ratio TF/tot deposition



Conclusions

- Particle-bound dry deposition of NO_3/NH_4 as well as base cations can be estimated as the net troughfall of sodium to the forest multipled by the ratio of the element to sodium deposition to teflon strings
- In Sweden, dry vs. total deposition constitute for nitrate 0 – 40% for inorganic N and 0 – 80% for base cations.
- The fraction of dry deposition decrease towards north-east for most elements but less for ammonium and potassium.

Thank you for your attention!

The Throughfall Monitoring Team