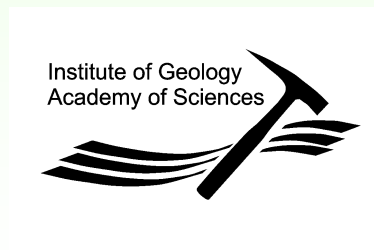


**The geochemical response of a heavily
impacted central European ecosystem
to air pollution
A case study of Lesni Potok
Czech Republic**

Tom Navratil





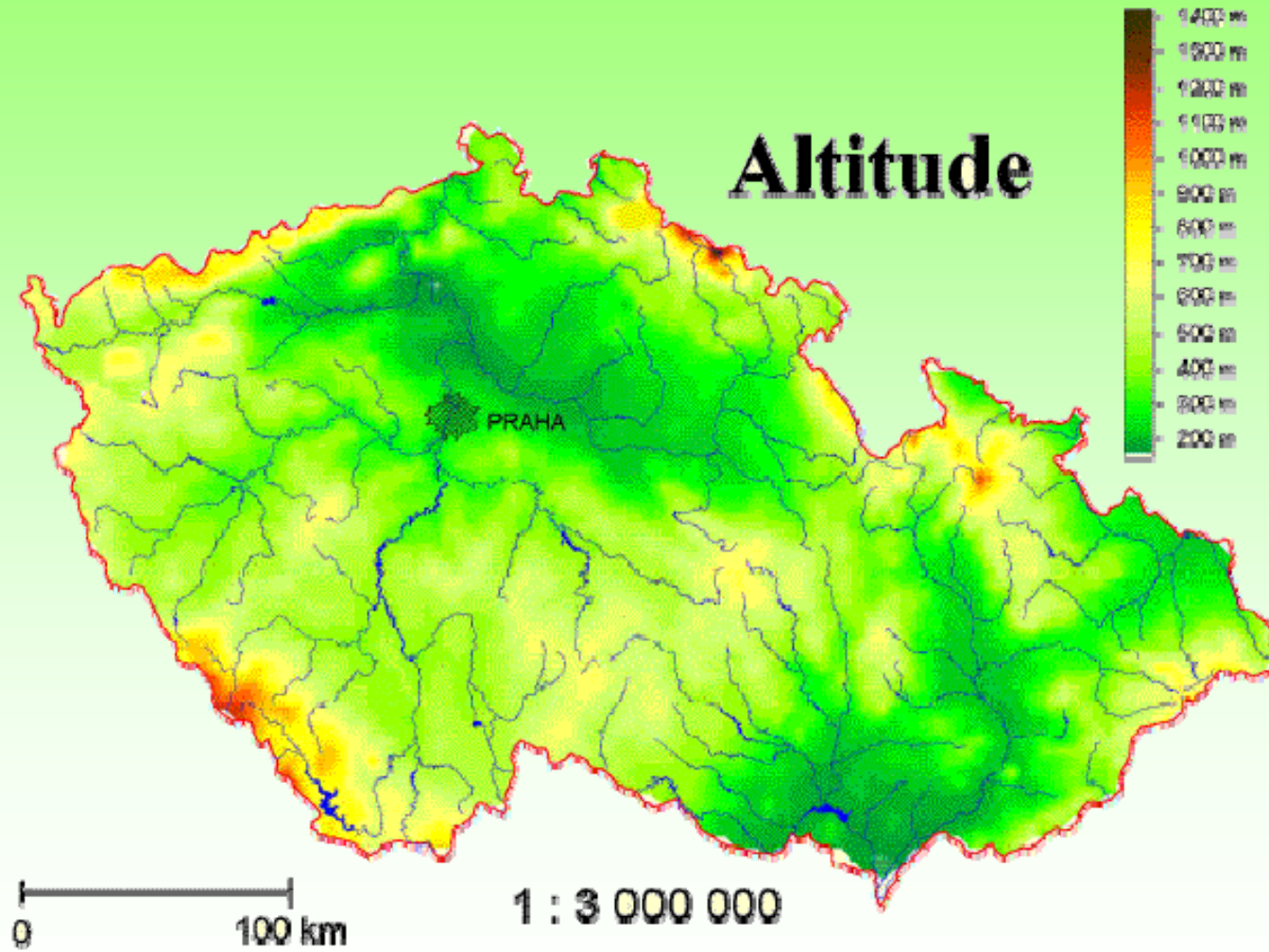
Czech Republic



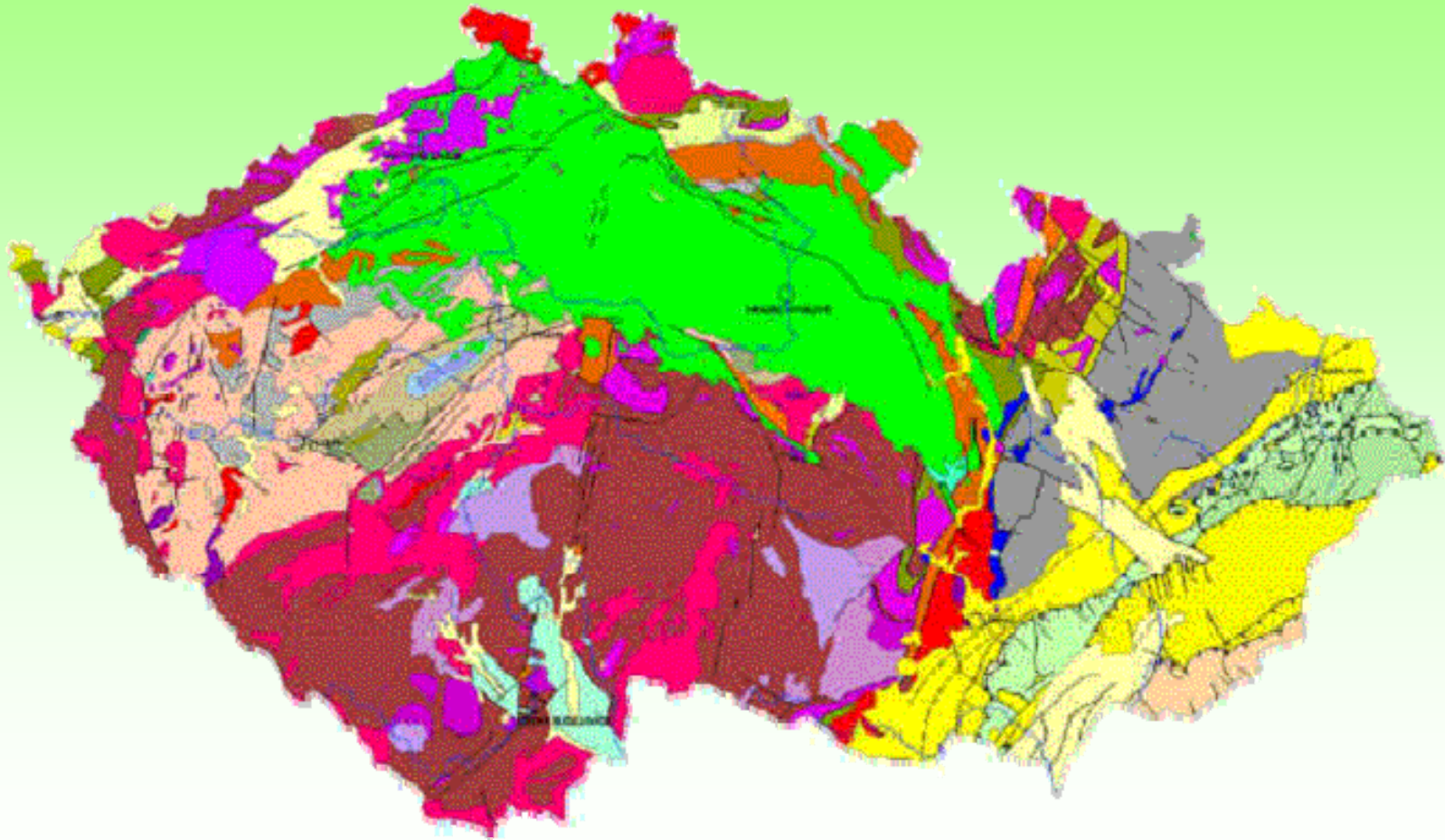
- area: 78,866 km²
- population: 10,241,000

- Maine
- area: 86,542 km²
- population: 1,275,000

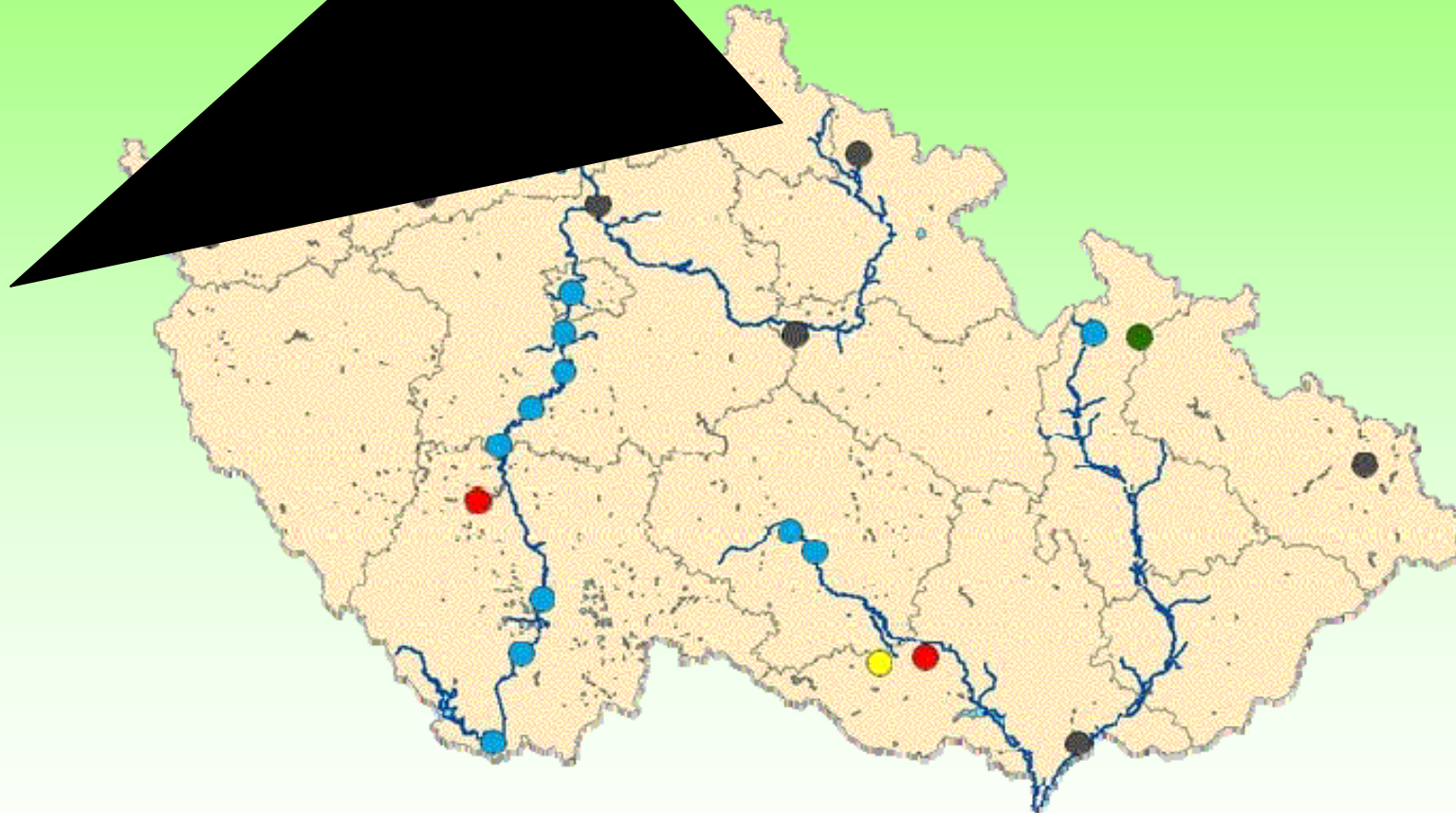
Czech Republic – Morphology



Czech Republic – Geology

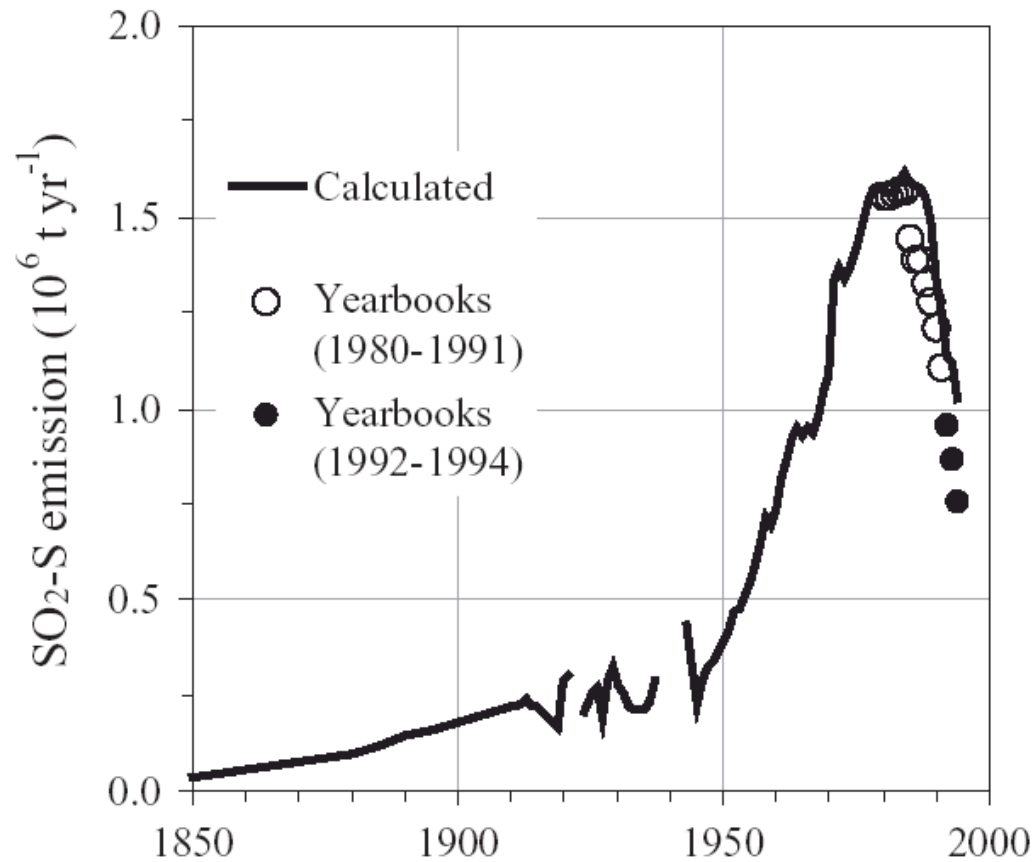


Czech Republic – Power



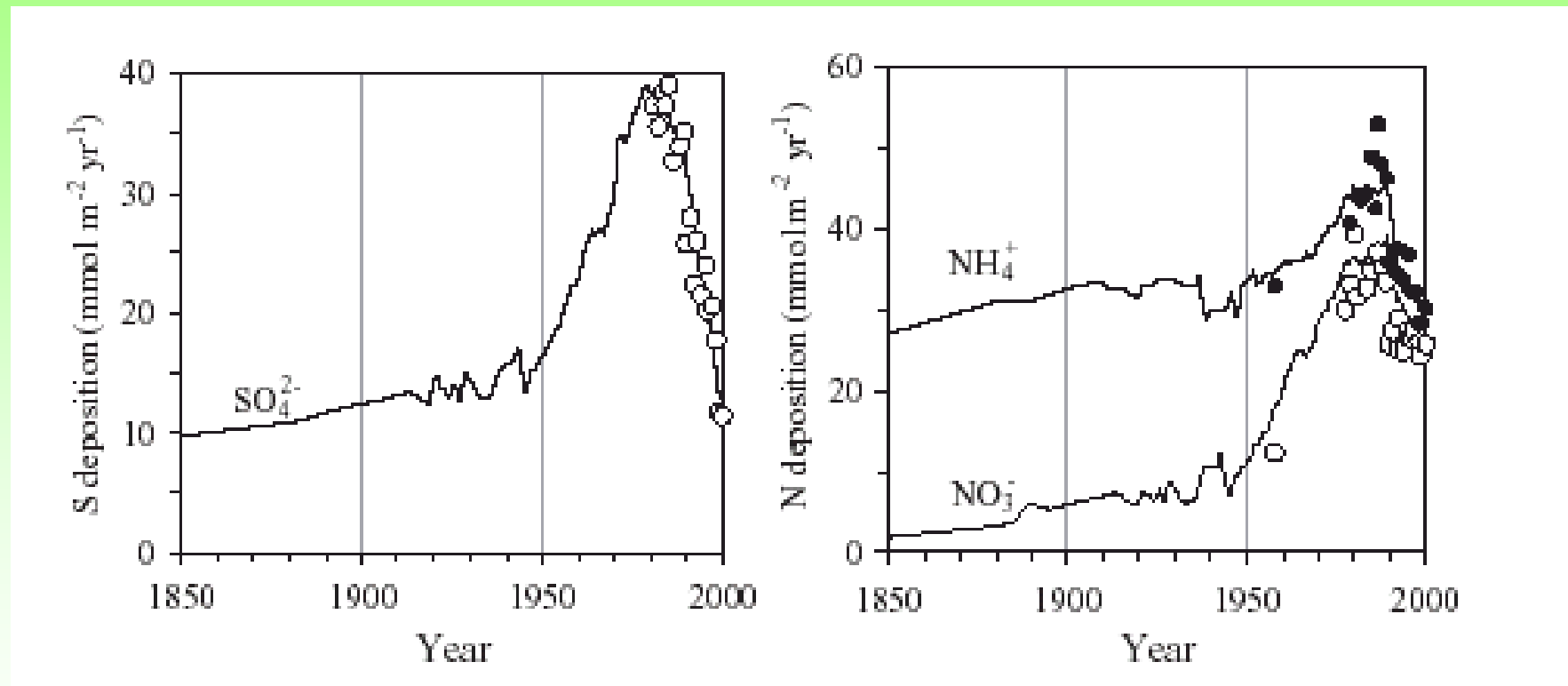
- black dots - coal powerplants

Czech Republic – Emissions



- figure from J. Kopáček, J. Veselý Atmospheric Environment 39 (2005)

Czech Republic – Acid deposition



- figure from J. Kopáček, J. Veselý Atmospheric Environment 39 (2005)

Environmental damage

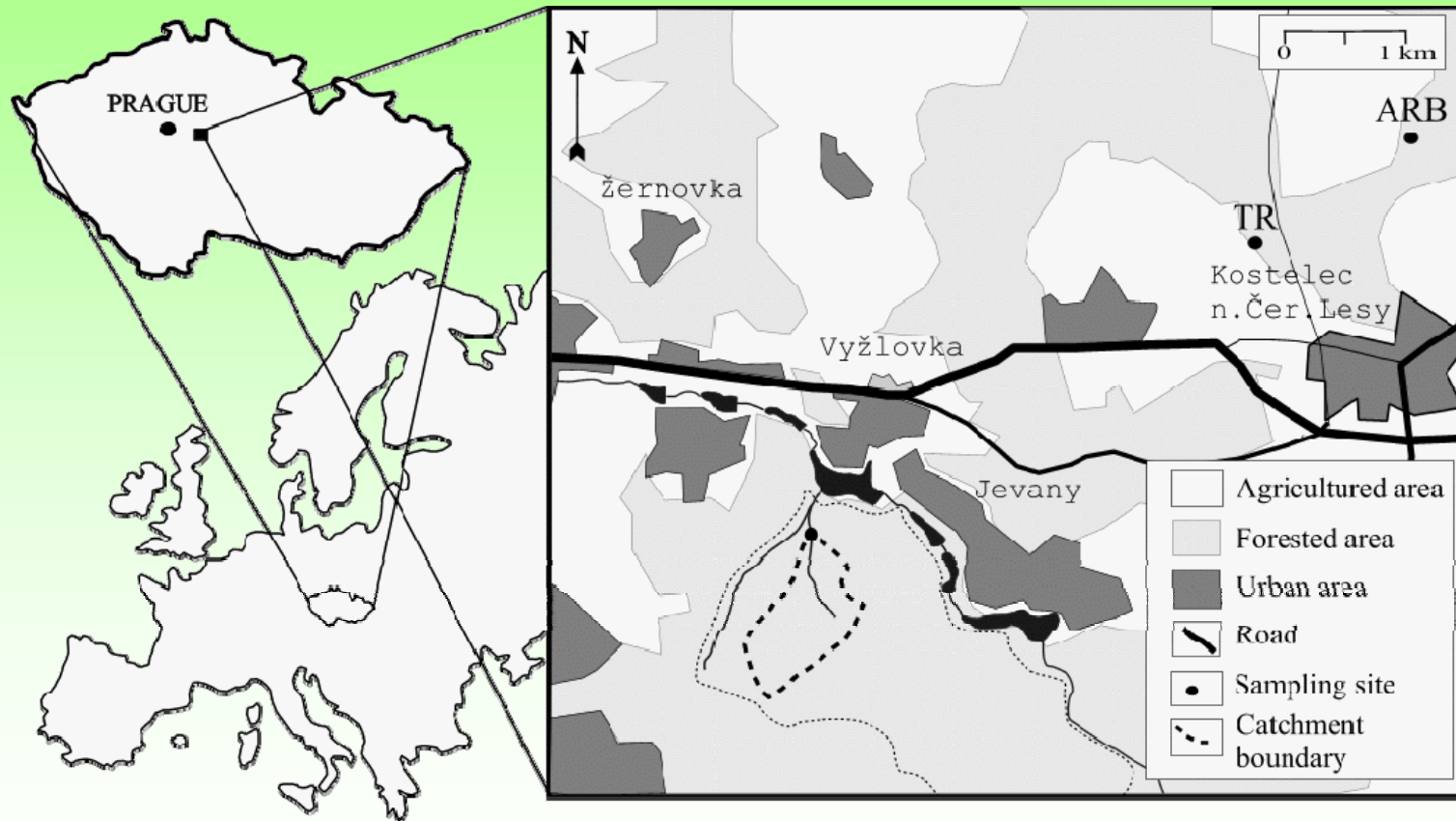


GEOMON monitoring network



• Czech Geological Survey

Lesní potok catchment



Lesni potok catchment



Lesni potok catchment



Lesni potok catchment - Basic data



- area of 0.765 km²
- altitude from 406 to 500 m a.s.l.
- mean annual temperature +9°C



Lesni potok catchment - Bedrock



Orthoclase (35%)

Plagioclase (28%)

Quartz (27%)

Biotite (8%)

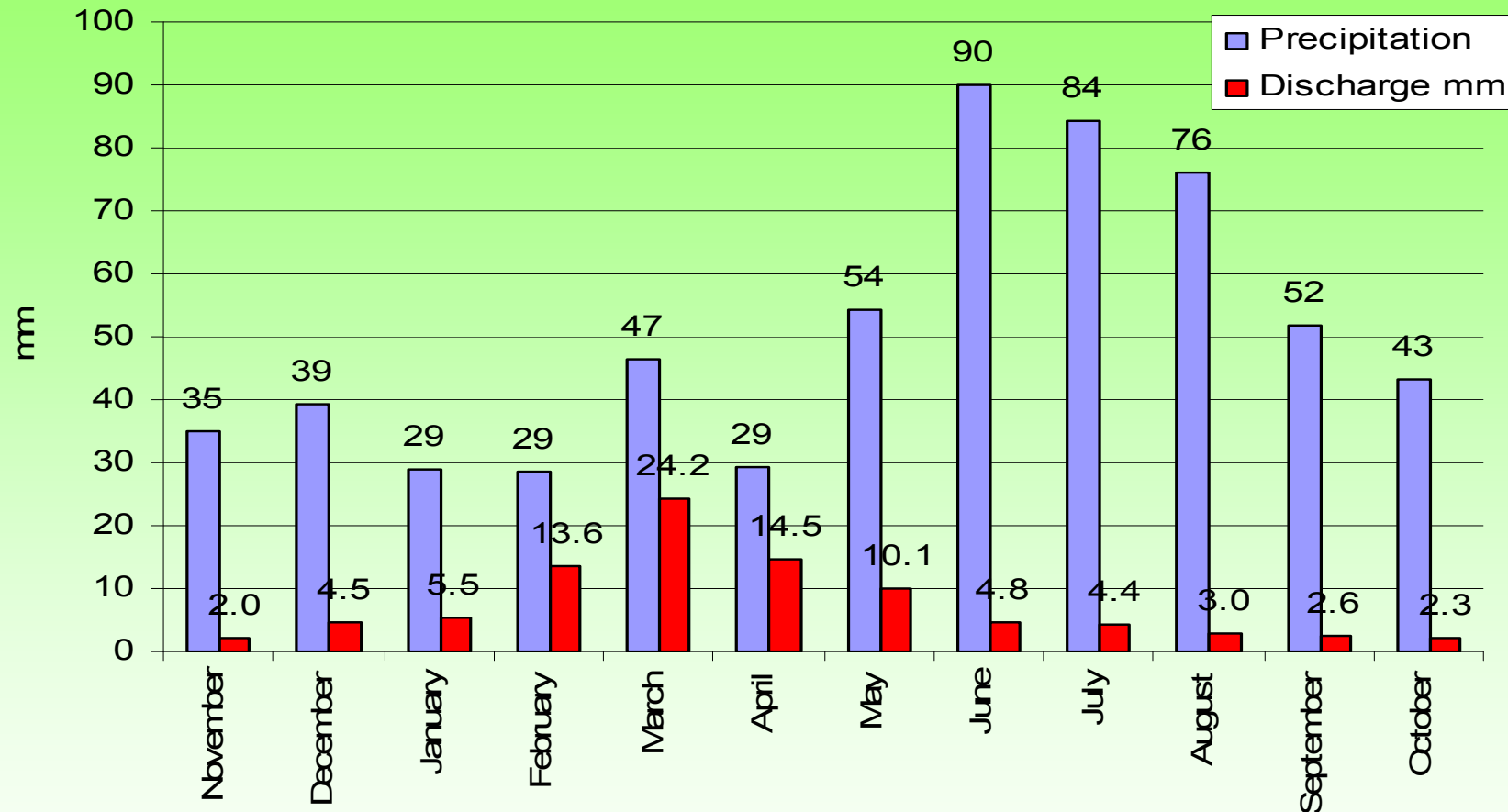
Lesni potok catchment - Soils

• DYSTRIC CAMBISOLS



- $\text{pH}_{\text{H}_2\text{O}}$ 3.6 – 4.5
 - $\text{CEC} = 294 \text{ meq.kg}^{-1}$
 - organic mat. 4 - 36%
 - BS 10 - 73%
-
- $\text{pH}_{\text{H}_2\text{O}}$ 4.0 – 5.2
 - $\text{CEC} = 73 \text{ meq.kg}^{-1}$
 - organic mat. 0.02 - 1.5%
 - BS 4 - 15 %

Lesni potok catchment - Hydrology

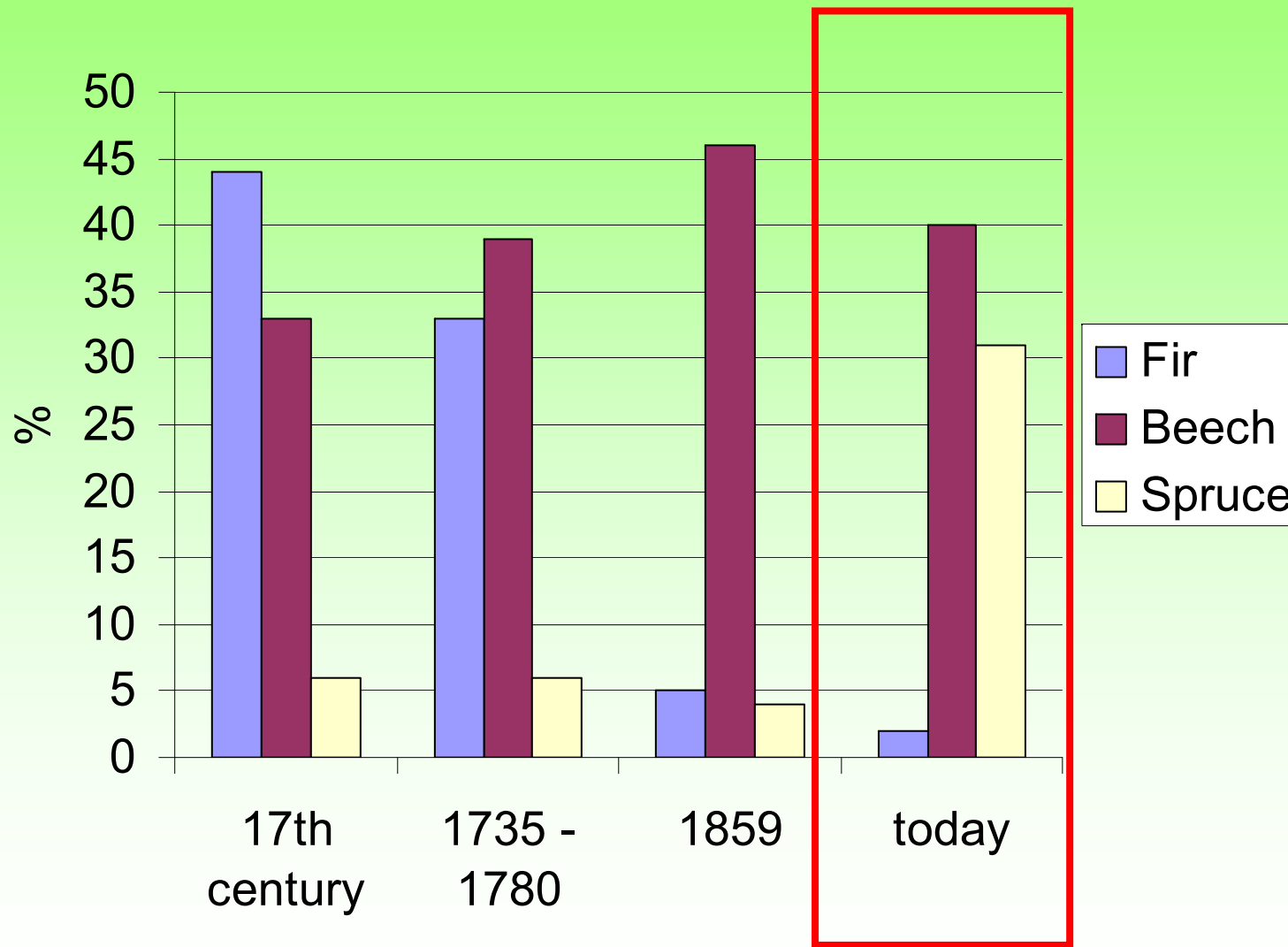


- mean annual precipitation height 690 mm
- mean annual runoff height 100 mm
- mean annual evapotranspiration ~ 80%

(based on chloride budget)

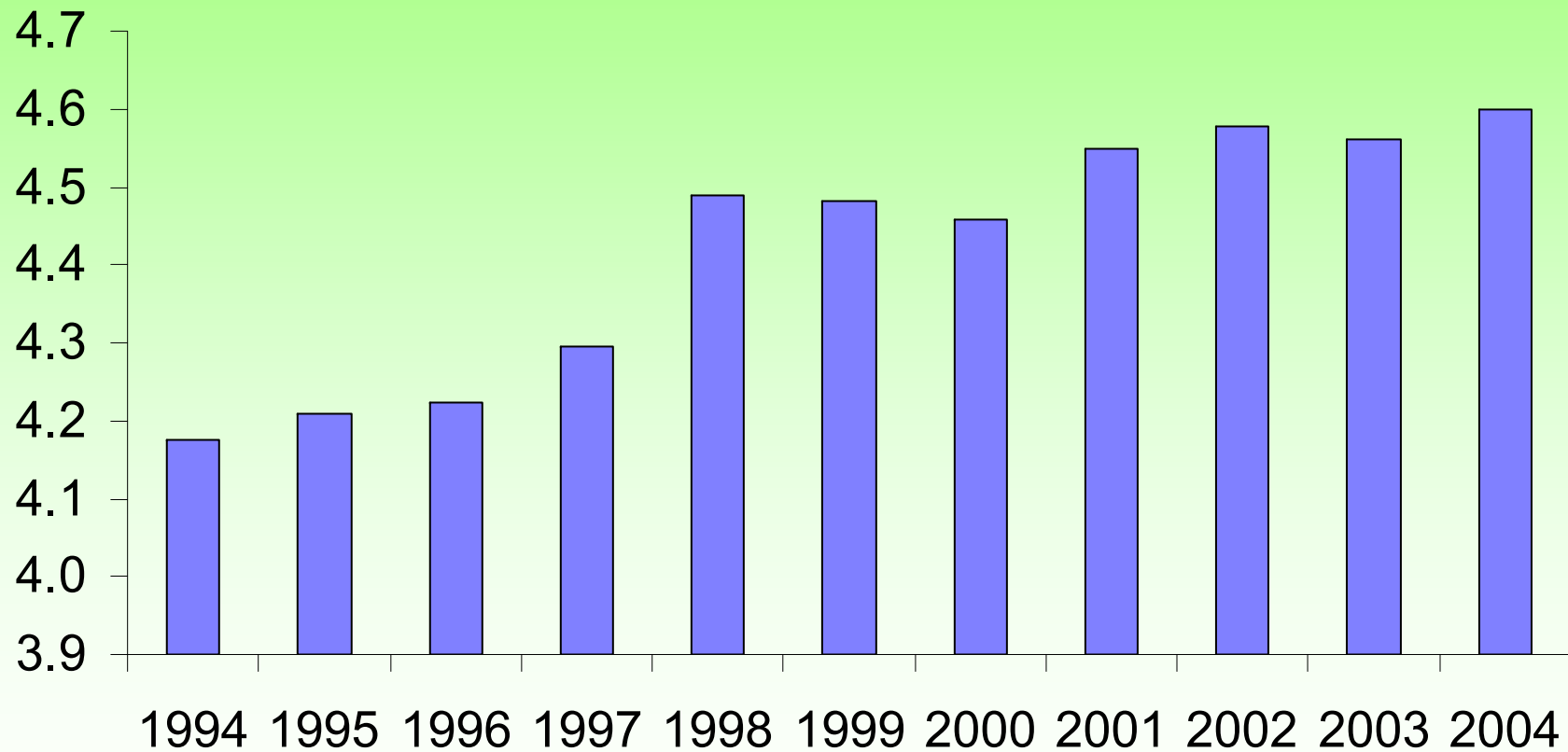
(14.6°C)

Lesni potok catchment – Vegetation

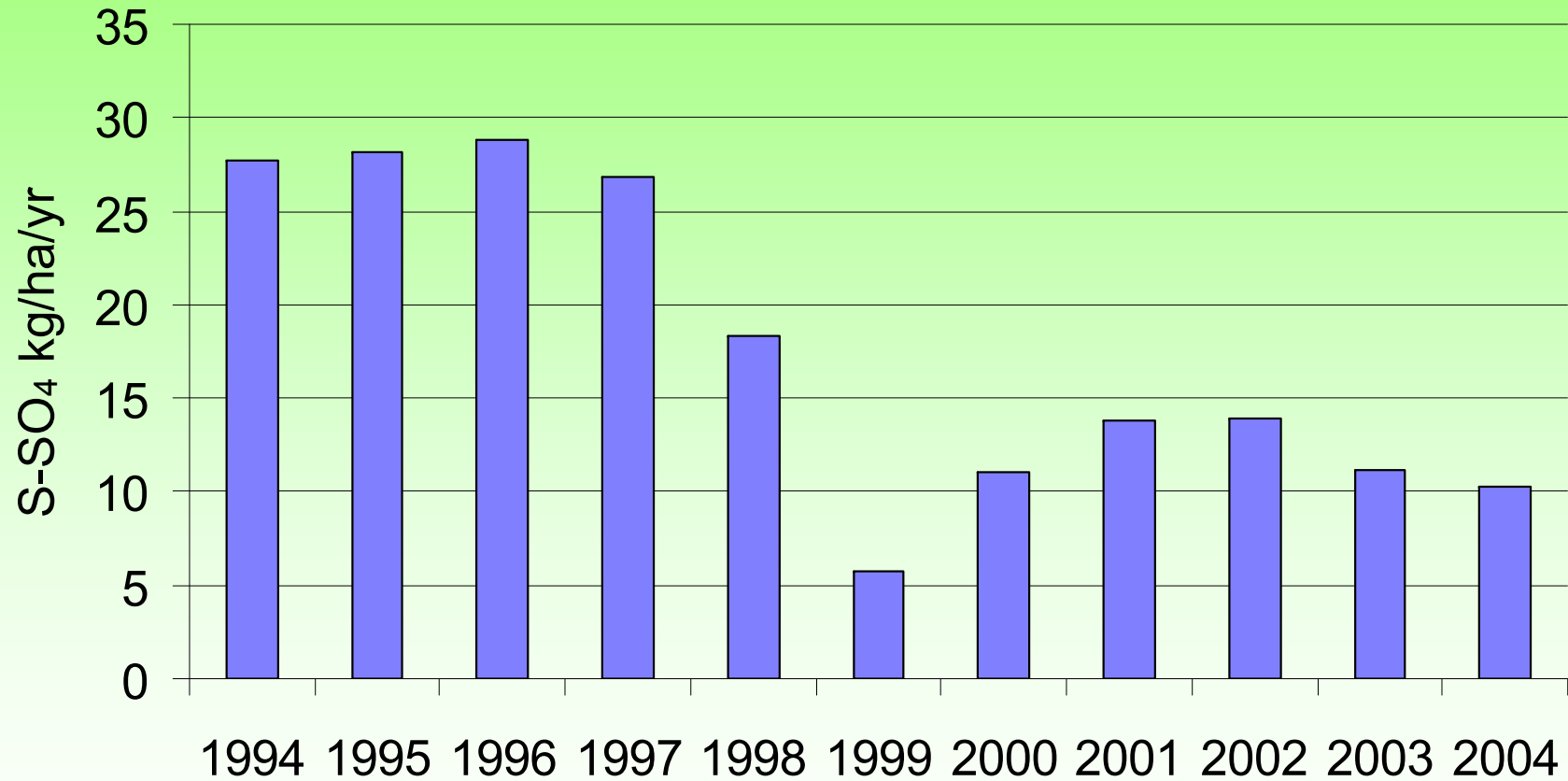


Bulk Deposition - pH

pH

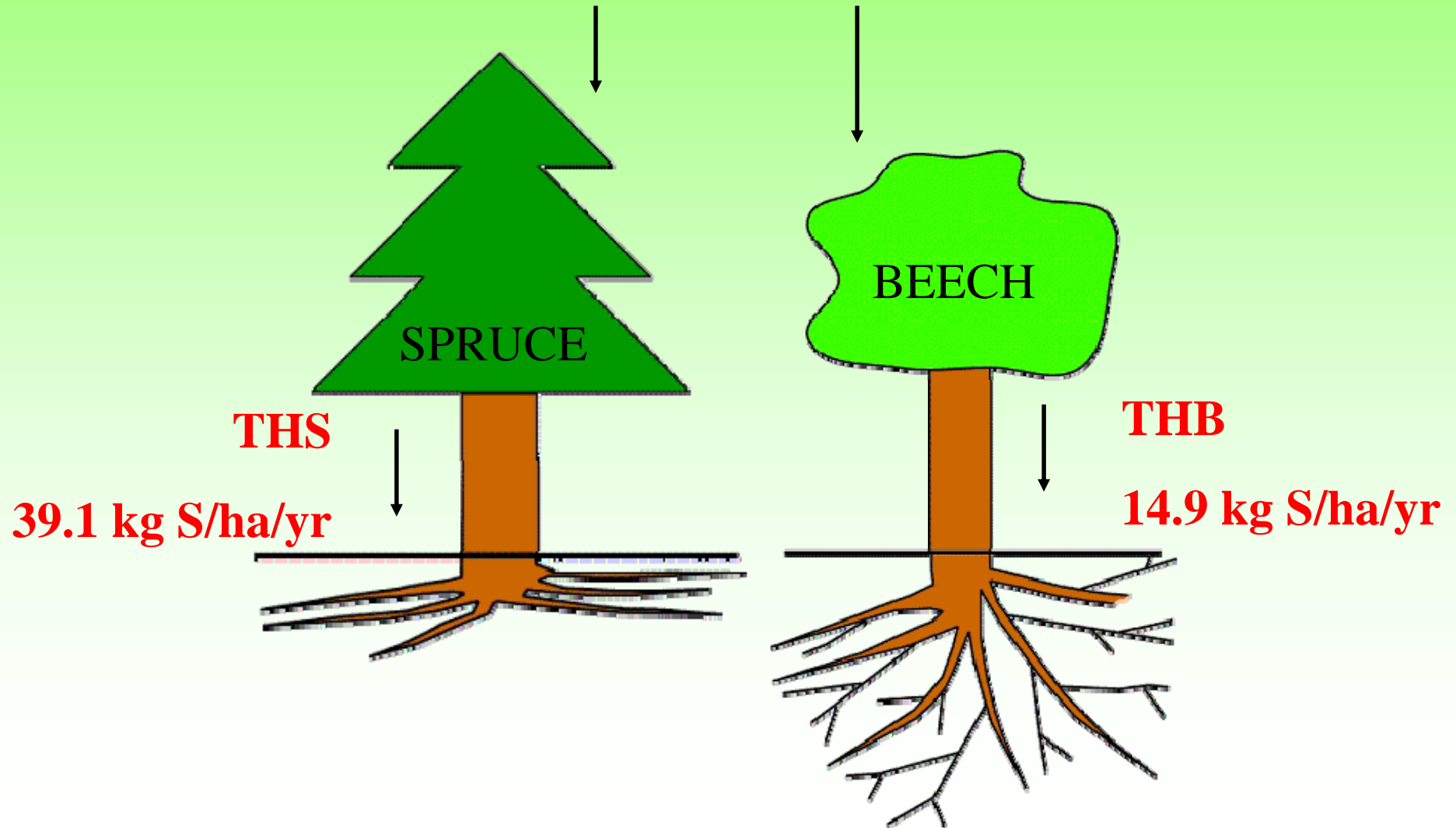


Bulk Deposition - Sulfur

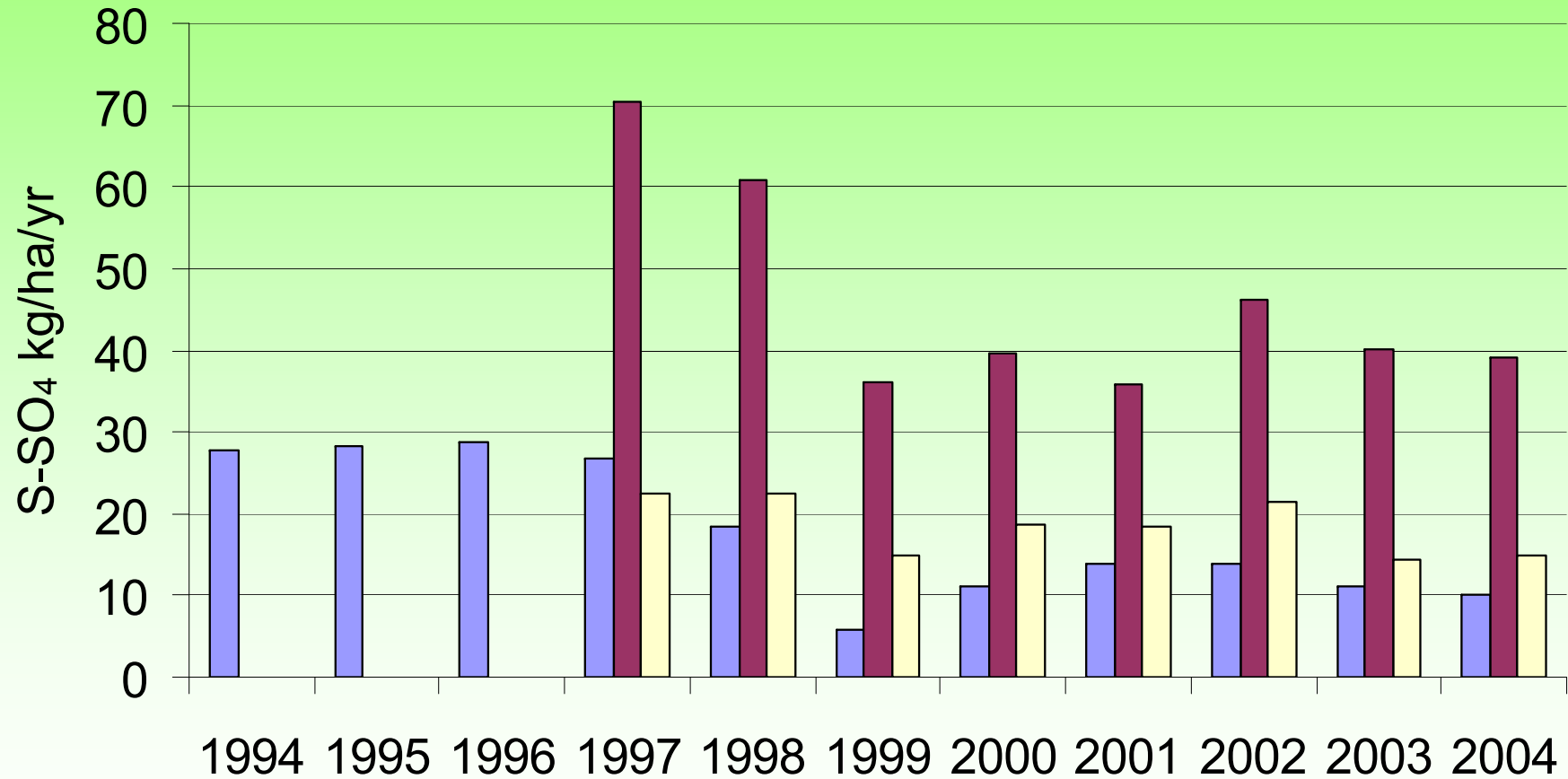


Throughfall deposition – Effect of vegetation

Bulk precipitation 10.2 kg S/ha/yr



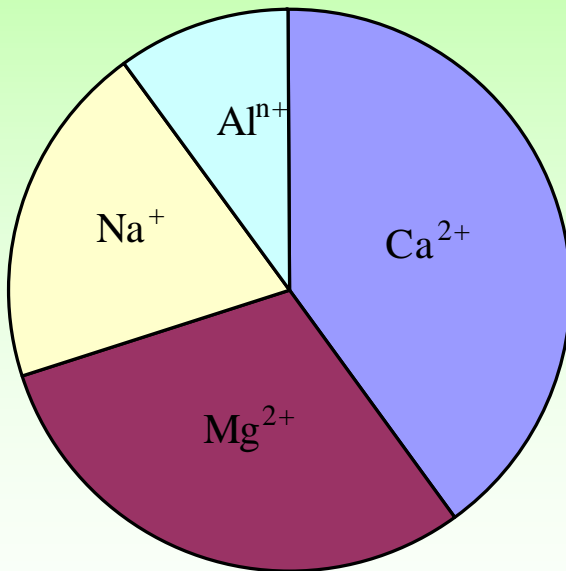
Throughfall deposition



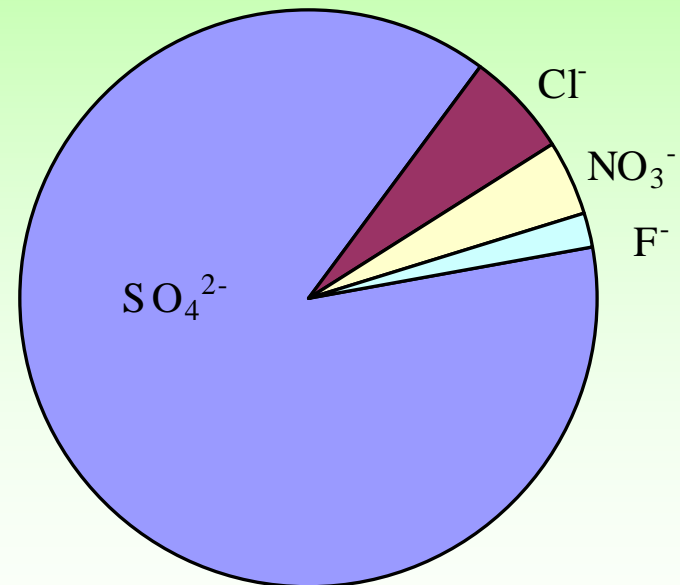
Effects on Water Chemistry

pH ~ 5.0

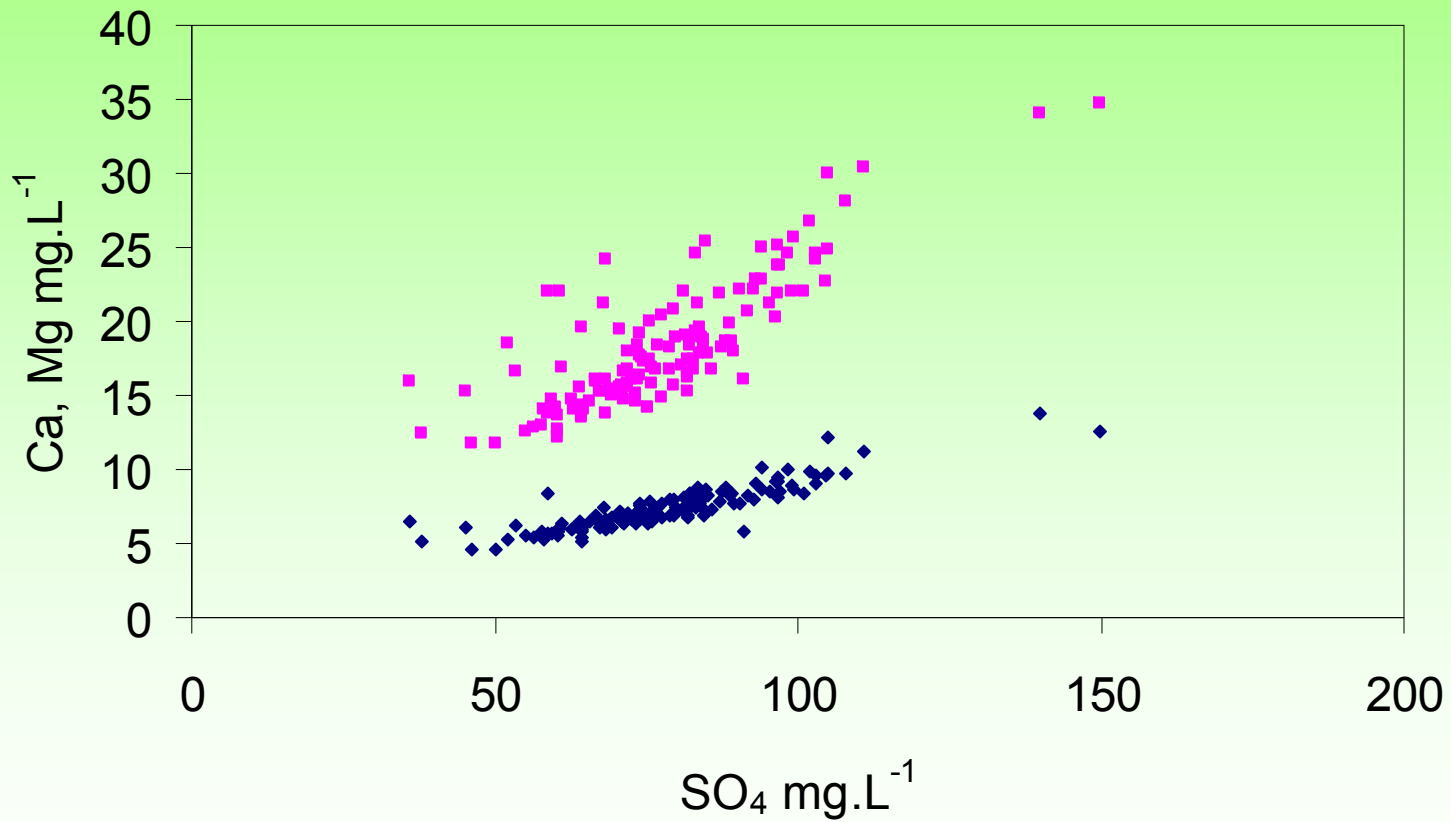
Cations



Anions



The BC (base cations)

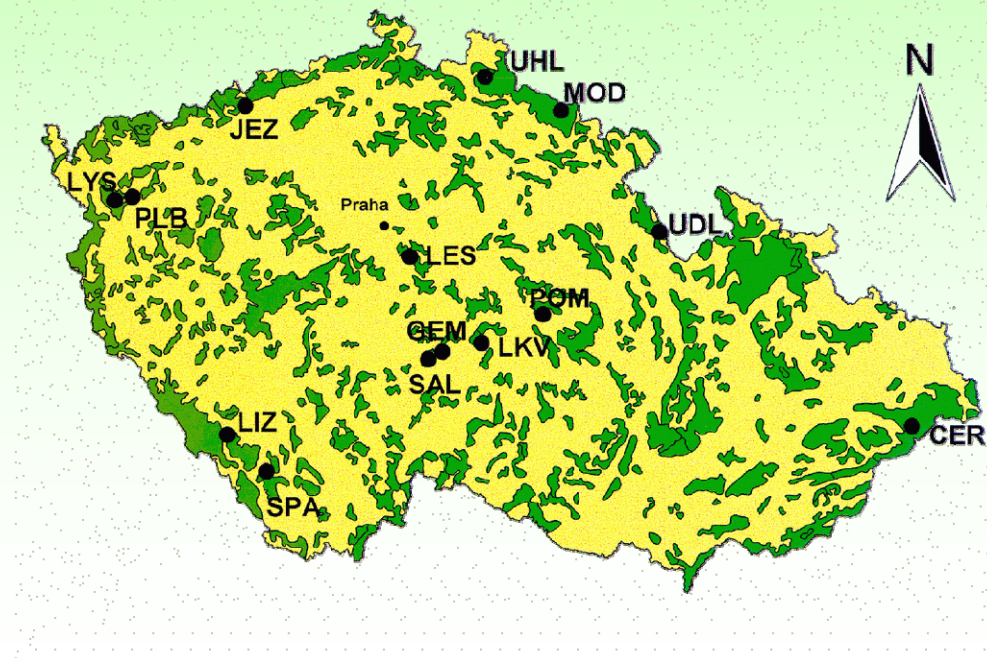


Effects of acidification

- increased amounts of toxic metals such as Al, Be, Cd etc. are mobilized, when there is no more buffering with BCs
- **increased amounts of exported (LOST) nutrients (BCs) from the ecosystem**
- **What happens then? Where are those BCs?**

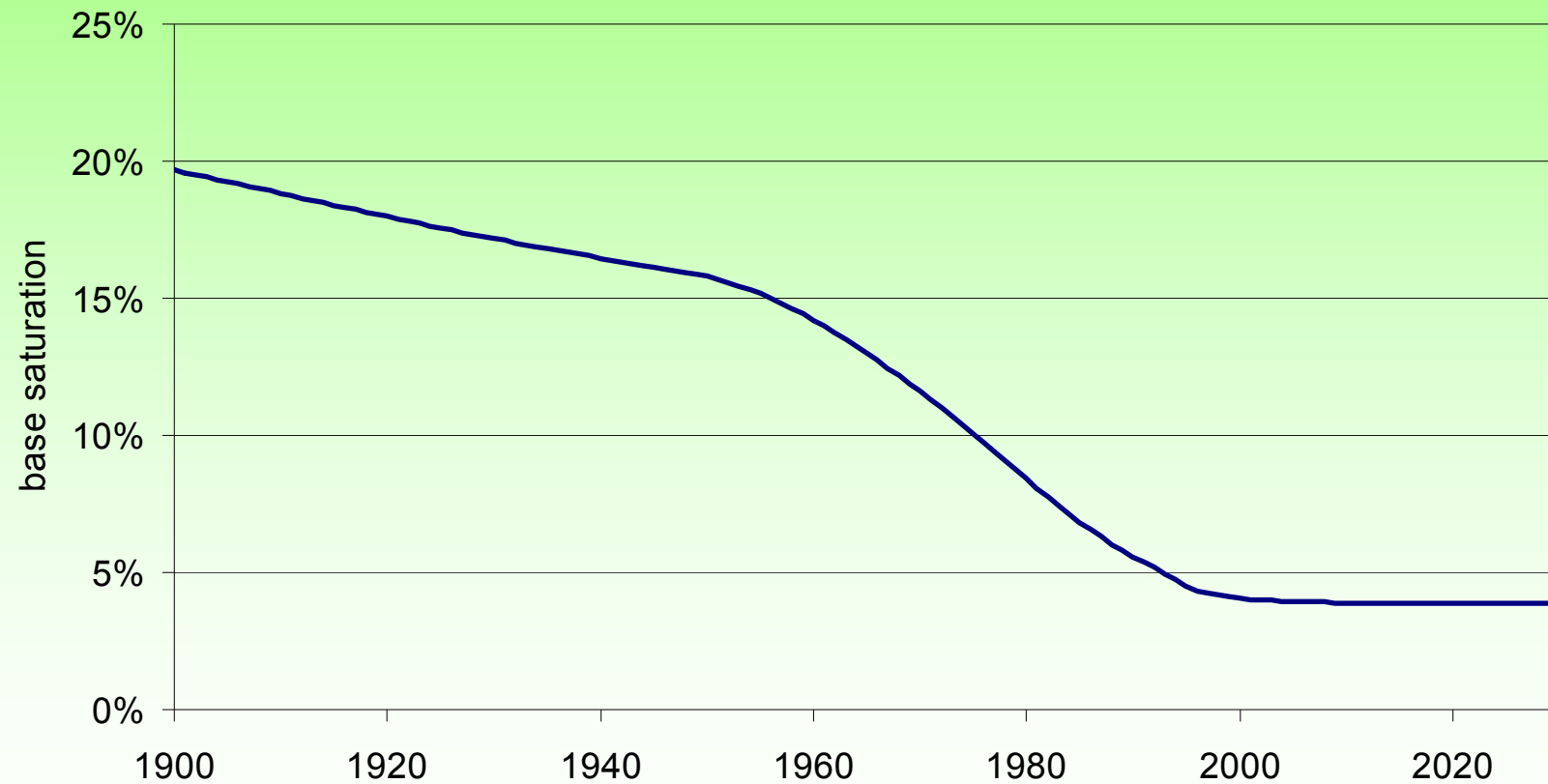
The extreme example - end member site

- catchment Lysina => inside the Black Triangle
- 100% spruce plantation
- higher altitude (1000m)
- higher precipitation height (900mm)
- lower annual temperature (7°C)



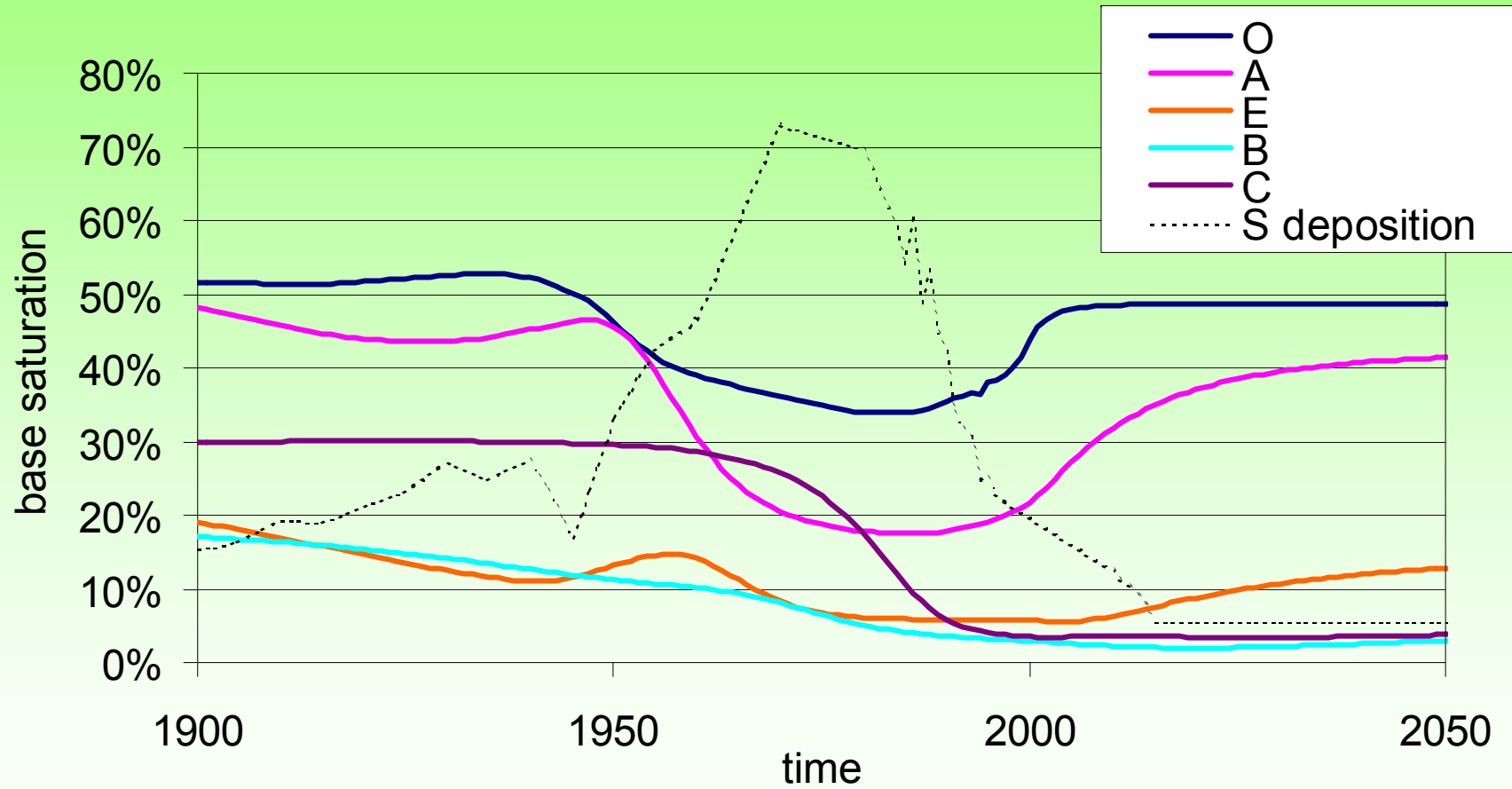
Effects on Soils

- dynamic soil acidification modeling MAGIC, SAFE etc.



- one layer approach

Effects on Soils - In detail



Conclusions

- **acidification caused severe damage to the soils (BS)**
- **uppermost horizons are recovering!**
- **the BS of B and C horizons will still decrease...**
- **acid deposition is NOT expected to decrease anymore**
- **so other measures must be applied to avoid further damage to soils (BS)**

THANKS

