Elevated sulfate and aluminium concentrations in soil solution of an acid sulfate forest site

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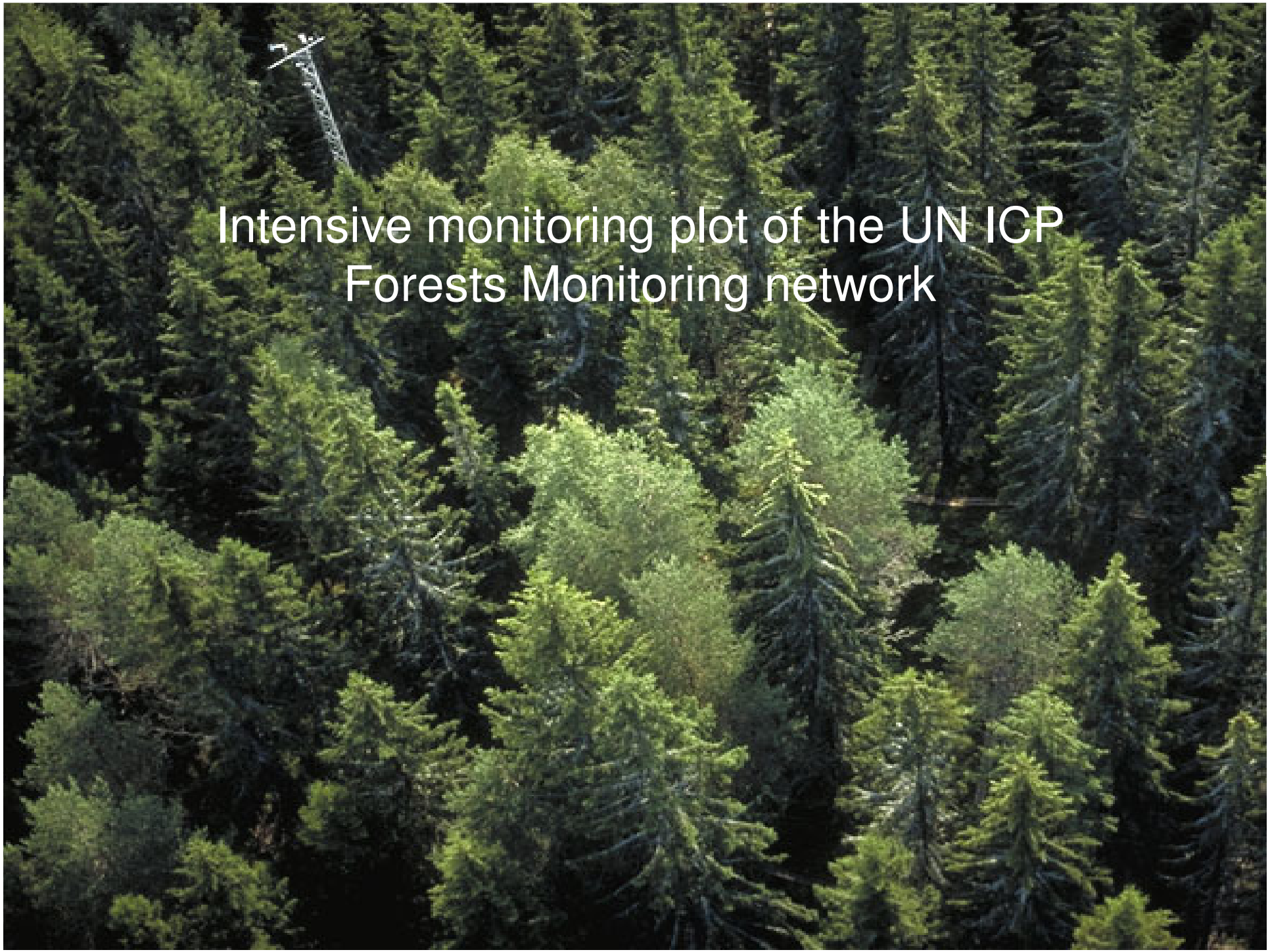
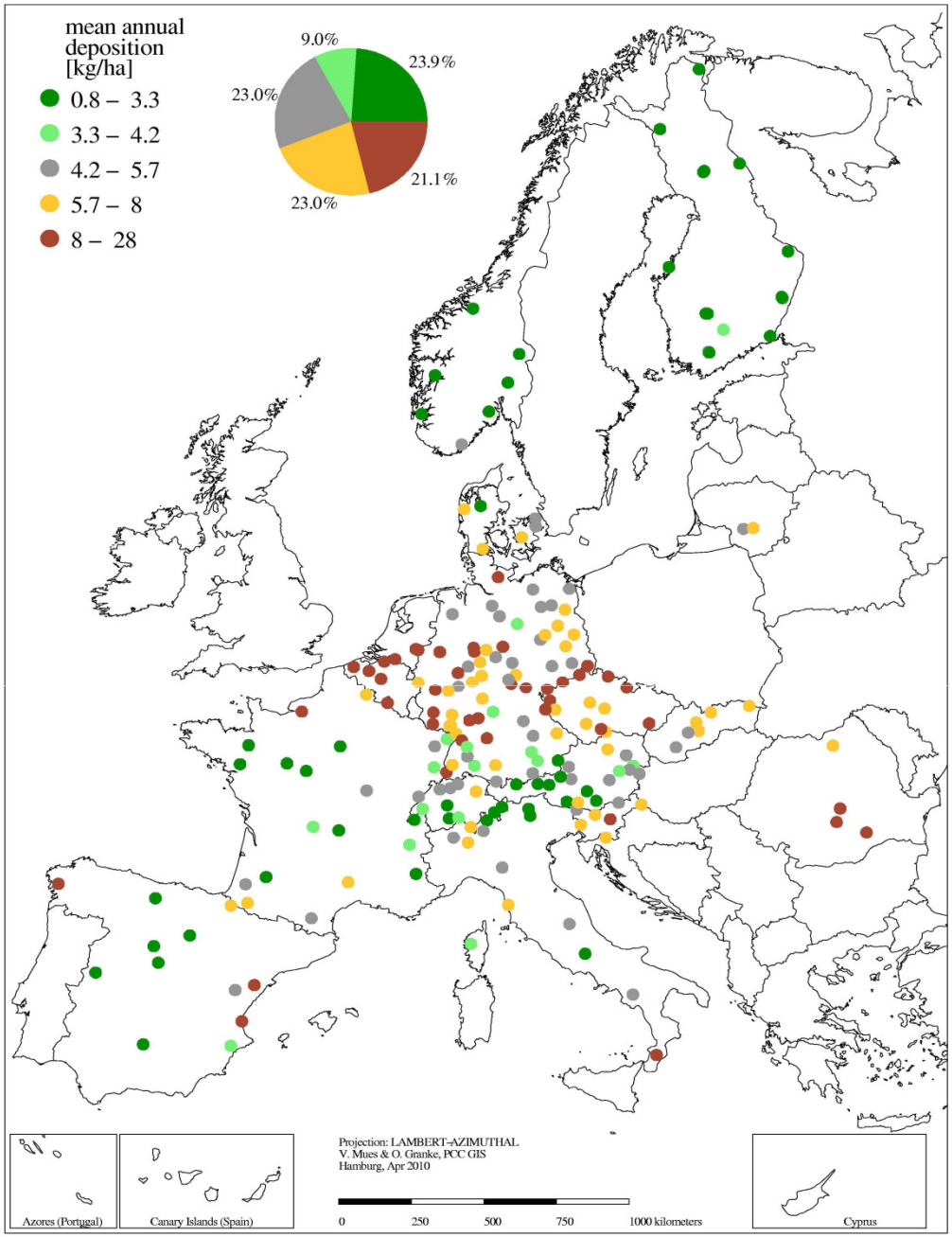

Intensive monitoring plot of the UN ICP
Forests Monitoring network

Why do we monitor forests?

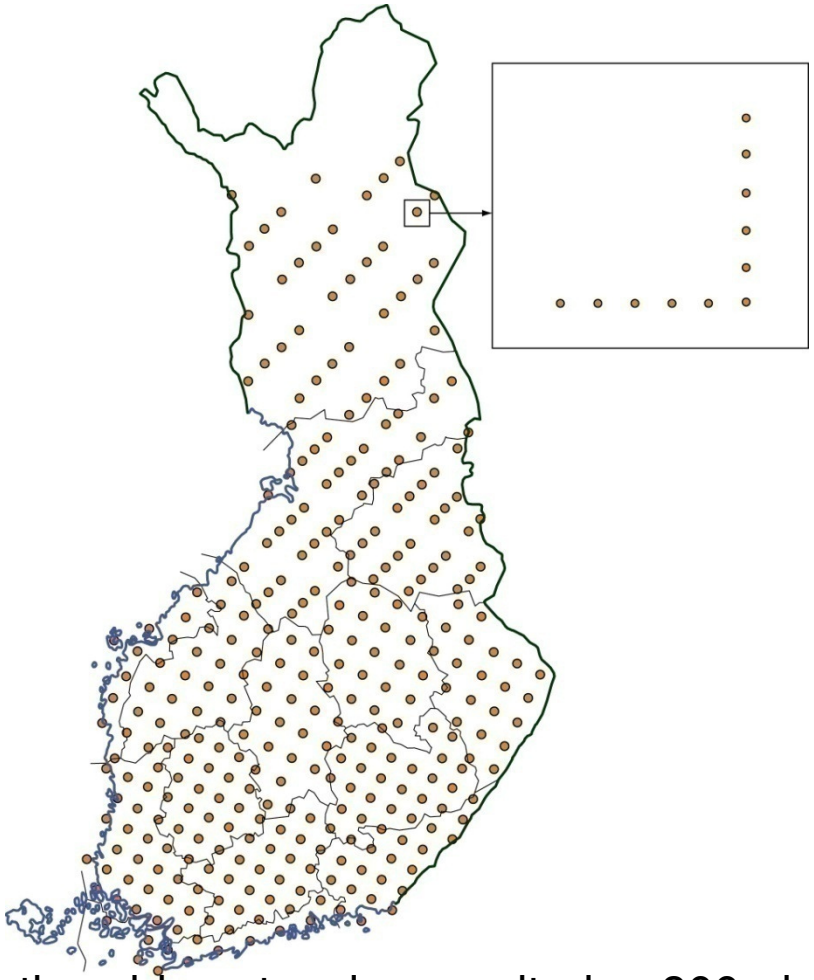
- Reliable information on forests is fundamental to sound forest and environmental policy, good decision-making and rational practical work
- Time series created through monitoring are the only reliable methods of detecting changes in forest
- Forest monitoring is carried out as collaboration via European network →UN ECE ICP Forests –program
- EU has been an important source of funding

European monitoring network

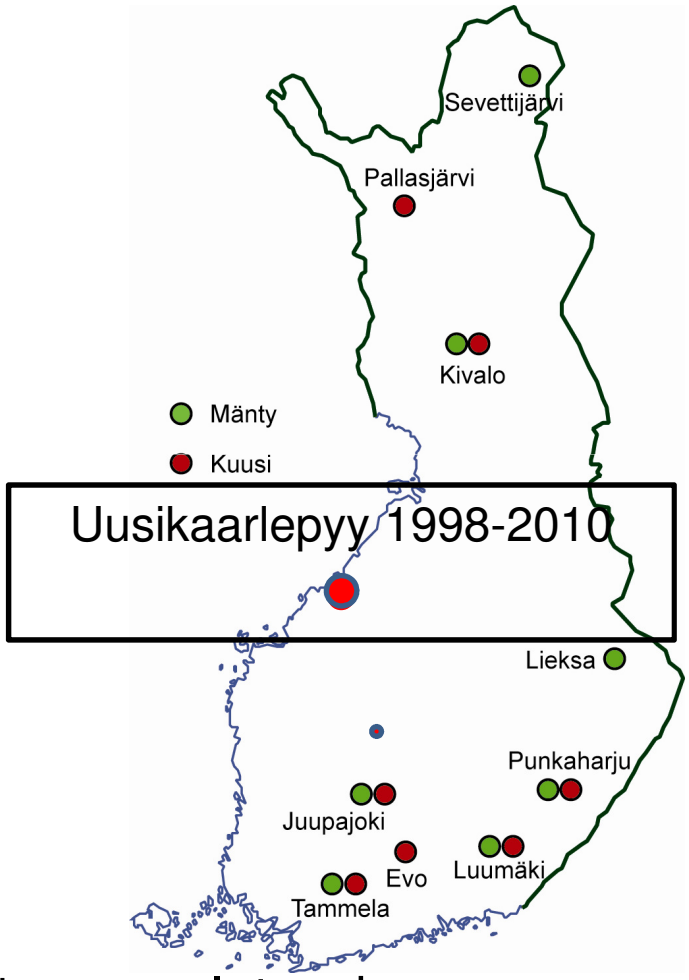
- Level II intensive monitoring network
- ca. 300 plots



National monitoring networks



Nationwide extensive monitoring,800 plots



Intensive monitoring

Photo Ismo Kyngäs

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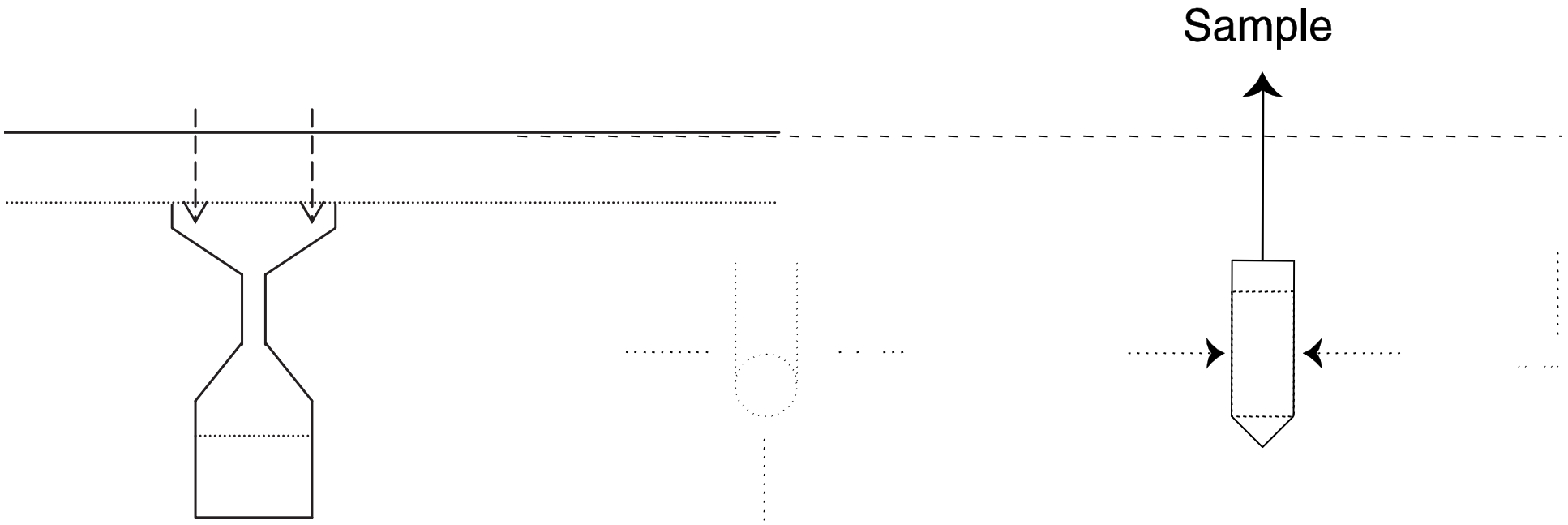
Soil characteristics:

	Organic layer	Mineral soil 0-5 cm	Mineral soil 5-10cm	Mineral soil 10-20 cm	Mineral soil 20-40 cm
pH (H_2O)	3.3	3.3	3.3	3.5	3.7
pH ($CaCl_2$)	2.9	2.9	3.1	3.4	3.7
BS%	54	35	25	17	16
CEC (meq/kg)	353	194	109	52	16
EA (meq/kg)	164	126	82	43	14
Al (mg/kg)	198	591	462	280	76
Ca (mg /kg)	2526	824	270	57	17

Data from Lindroos, A.-J., Derome, J., Raitio, H. & Rautio, P. 2007. Water, Air, and Soil Pollution 180(1): 155-170)

Deposition Leaching

Monthly sampling of soil solution during snowfree period



Zero-tension
funnel type lysimeter
•5 cm depth, 5 replicates
•20 cm depth, 5 replicates
•40 cm depth, 5 replicates

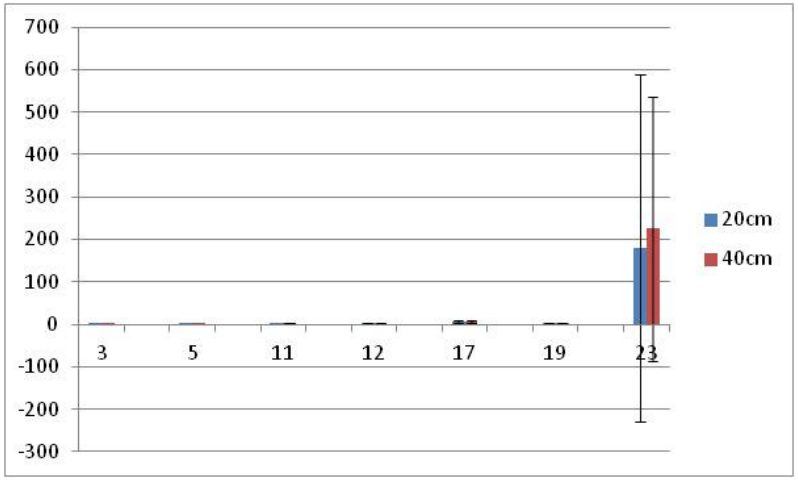
Tension lysimeter
Suction cup
•20 cm depth, 6 replicates
•40 cm depth, 6 replicates

Laboratory measurements

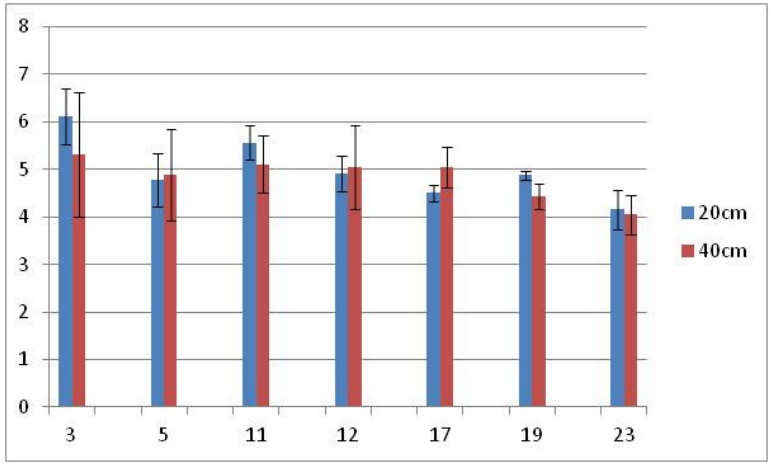
- Samples filtrated through 0.45 µm membrane filter
- **SO_4** analysed by Ion Cromatography (IC)
- **Al** by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)
- **pH** from an unfiltered subsample

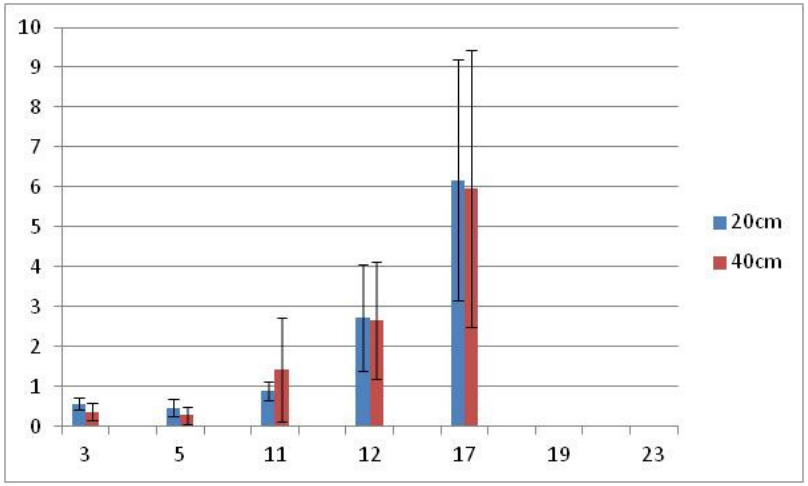
Soil solution, ASS site, nr. 23 vs. other spruce sites

SO_4-S, suction cups

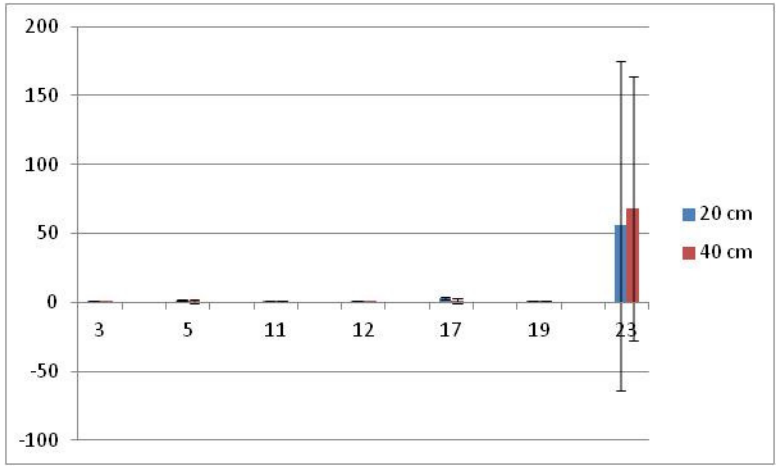


pH, suction cups

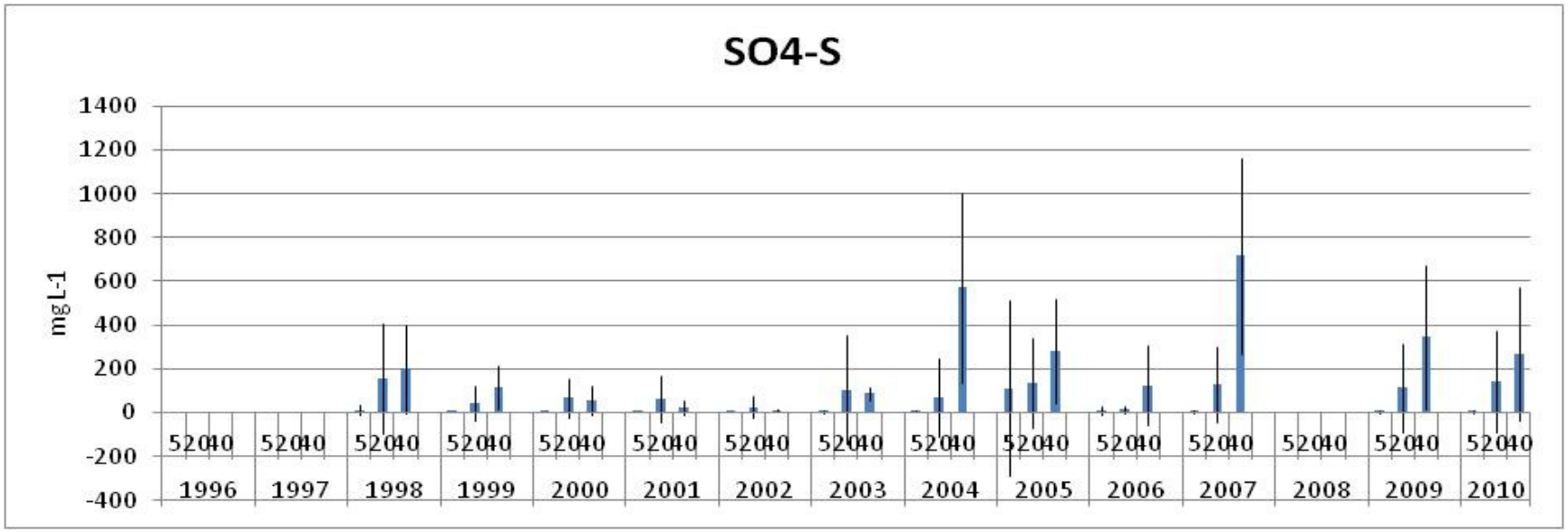


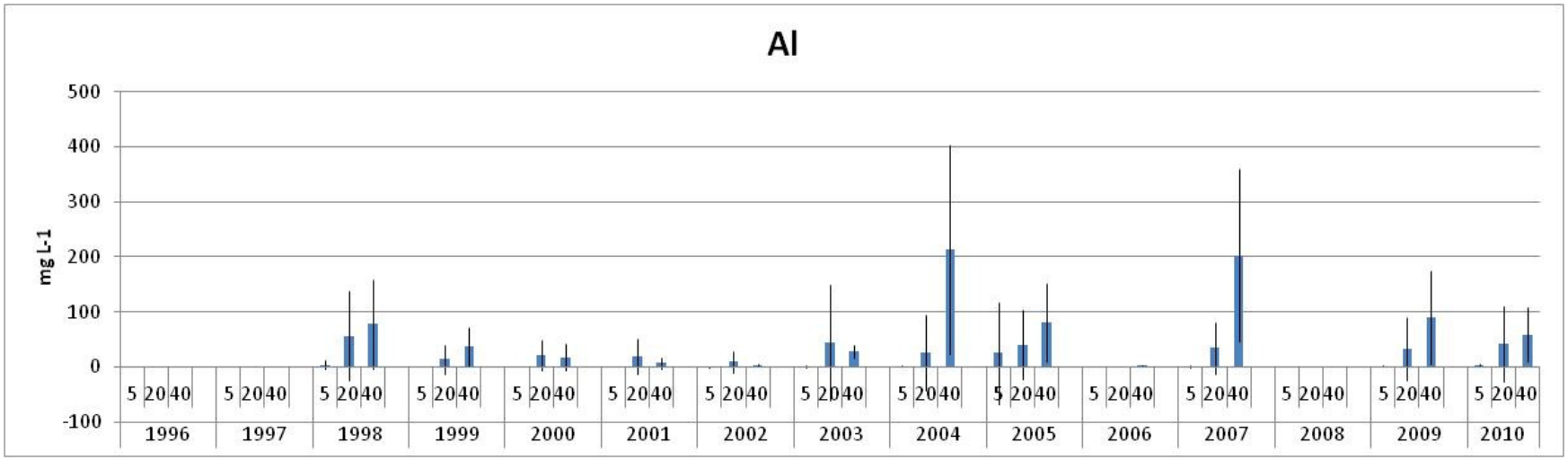


Al ,suction cups

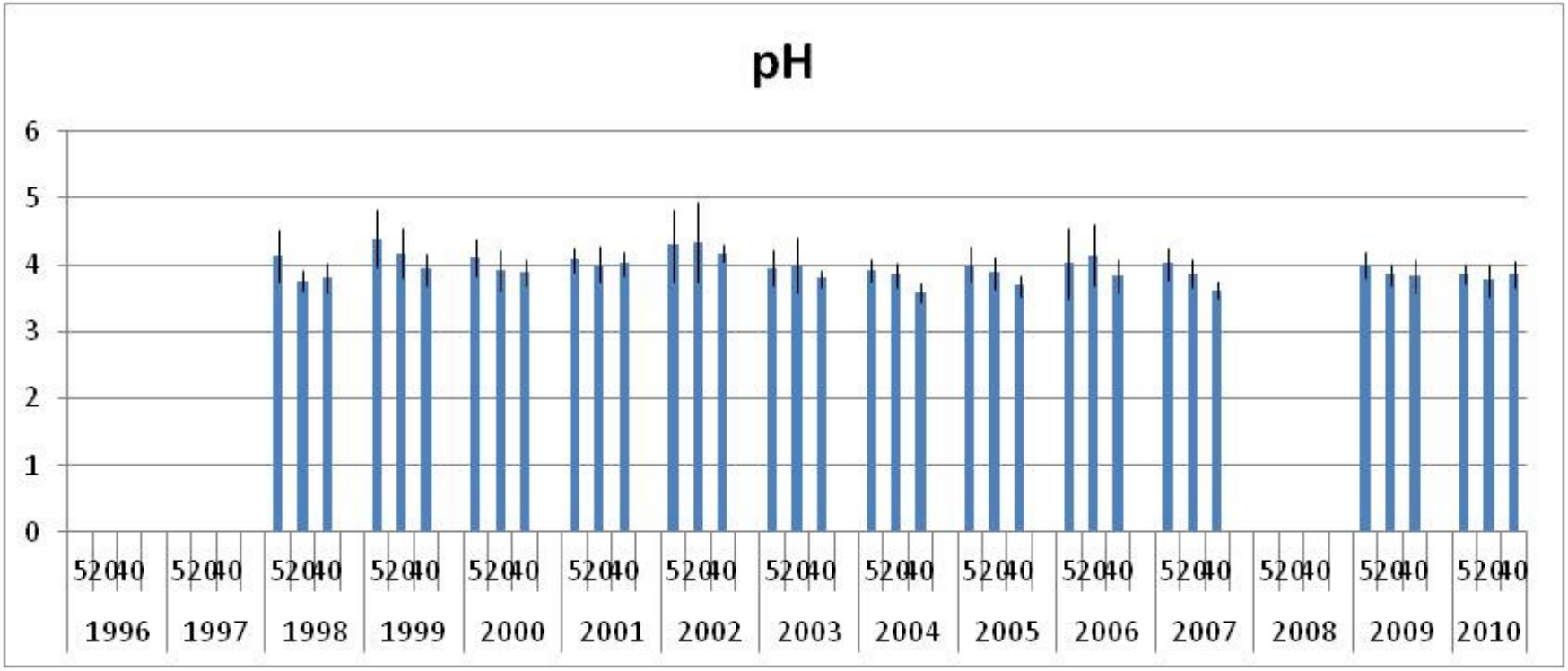


Annual mean values 1996-2010 at ASS site (plot 23), zero-tension lysimeters



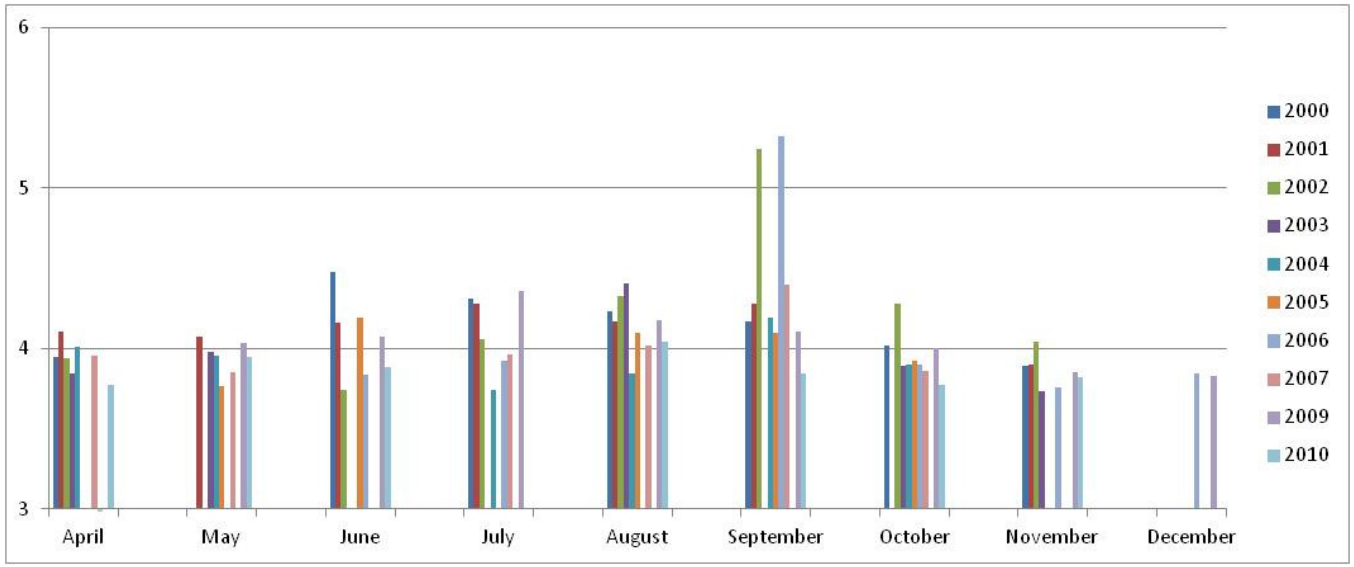


Annual mean pH, ASS site, plot 23

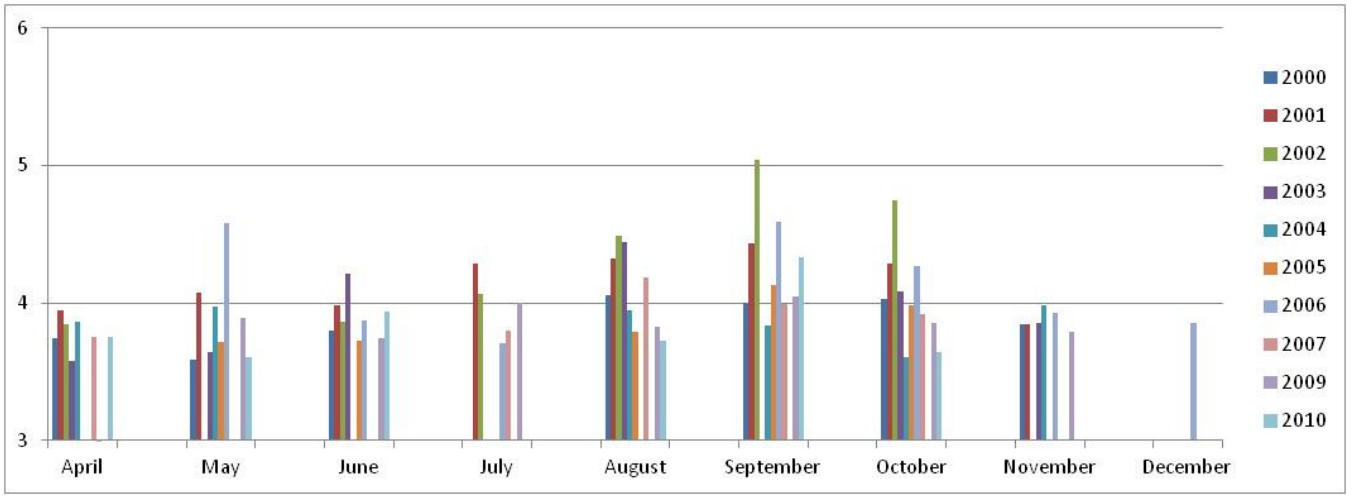


Seasonal variation, median

pH
Zero-tension
5 cm

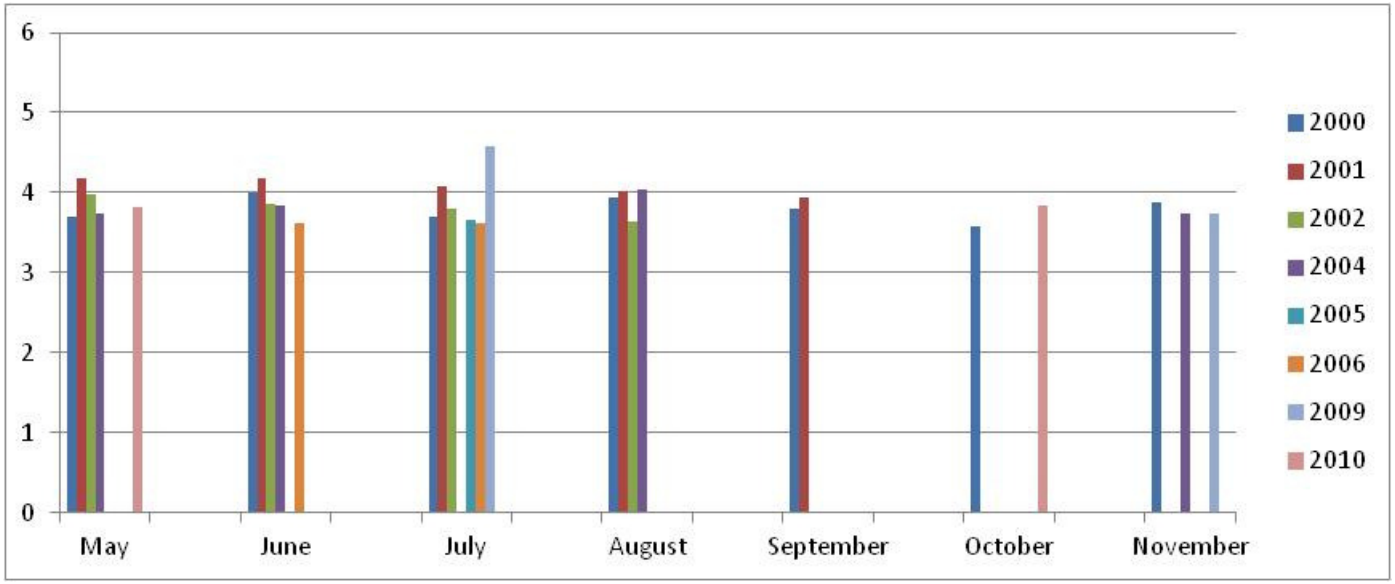


pH
Zero-tension
20 cm

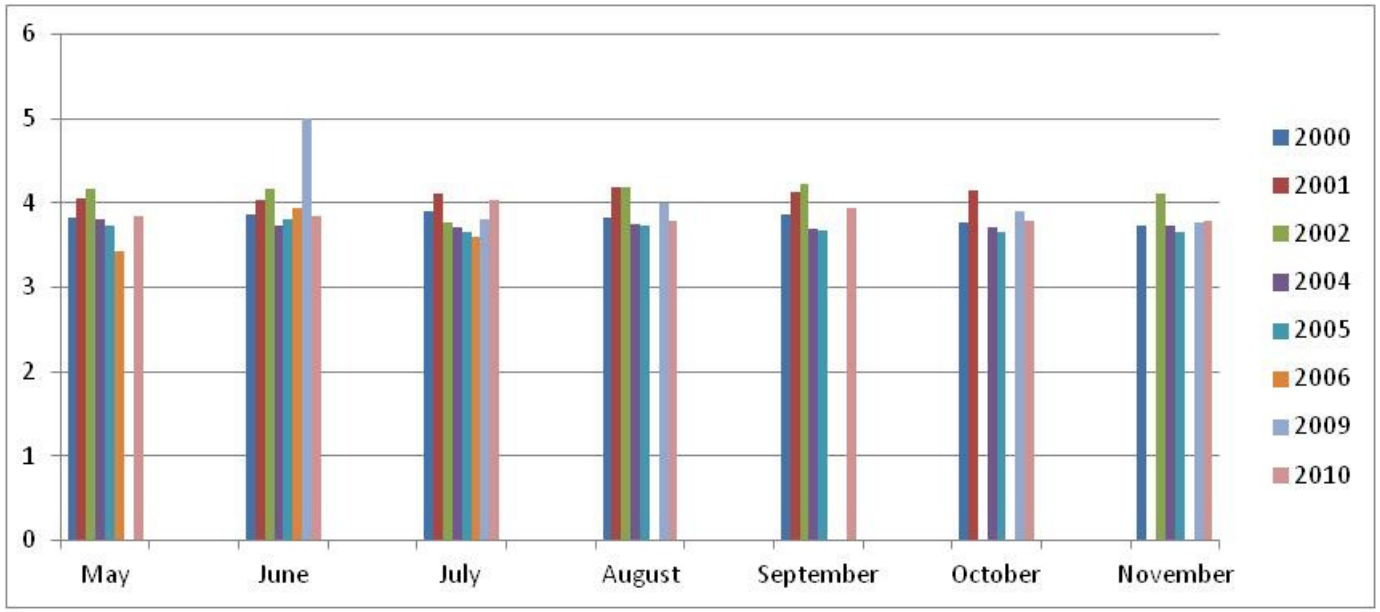


Seasonal variation, median

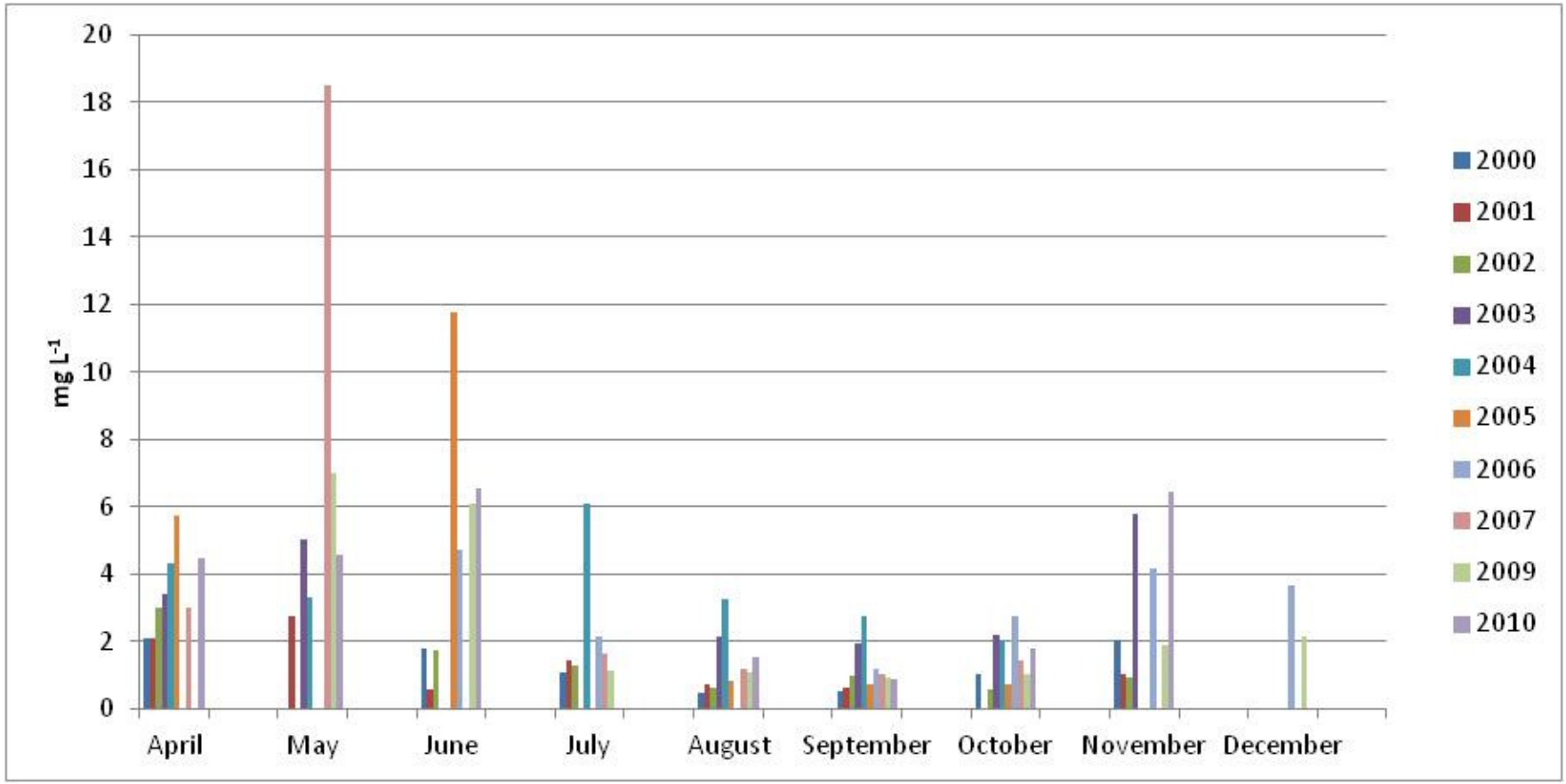
pH
suction cups
20 cm



pH
suction cups
40 cm

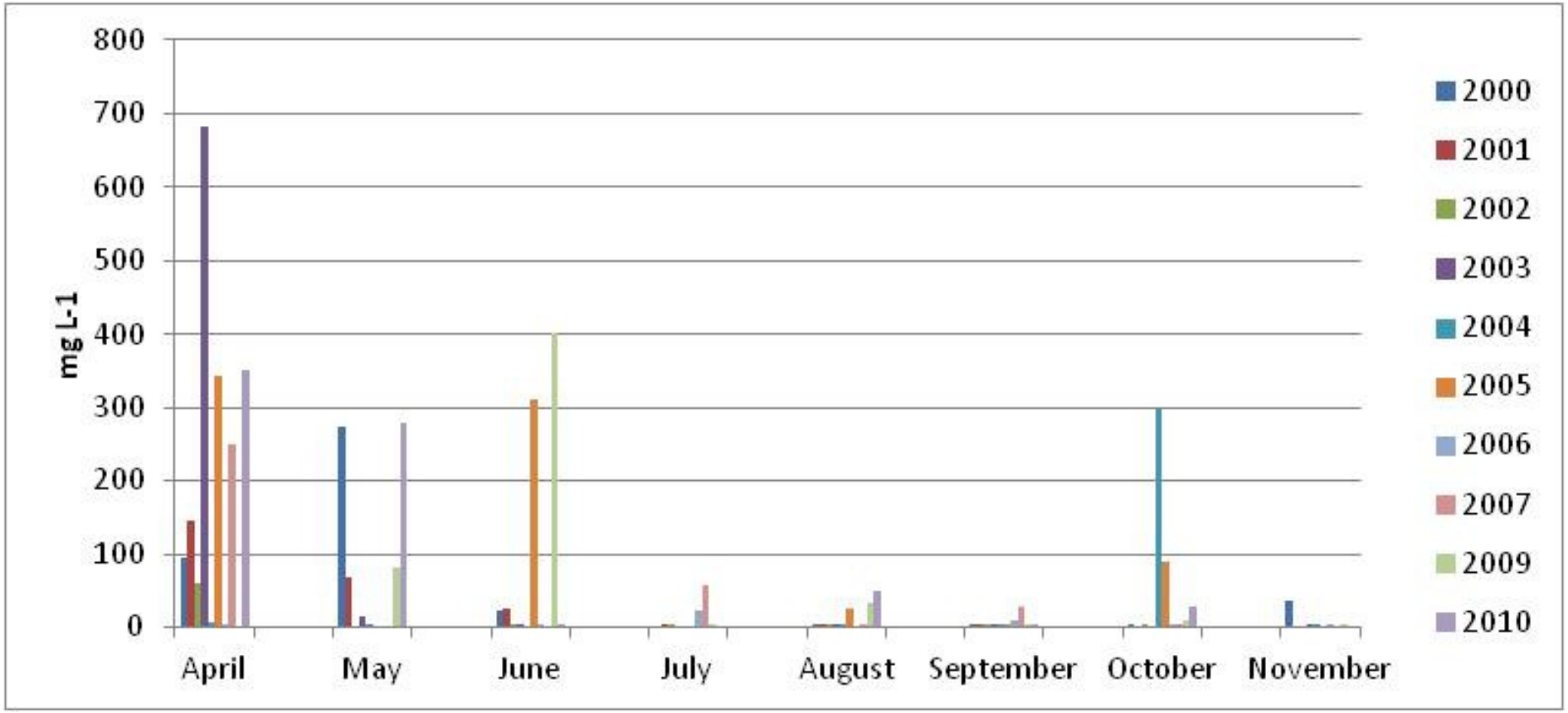


SO_4-S (mg L^{-1}), Seasonal variation
zero-tension (median), 5 cm depth



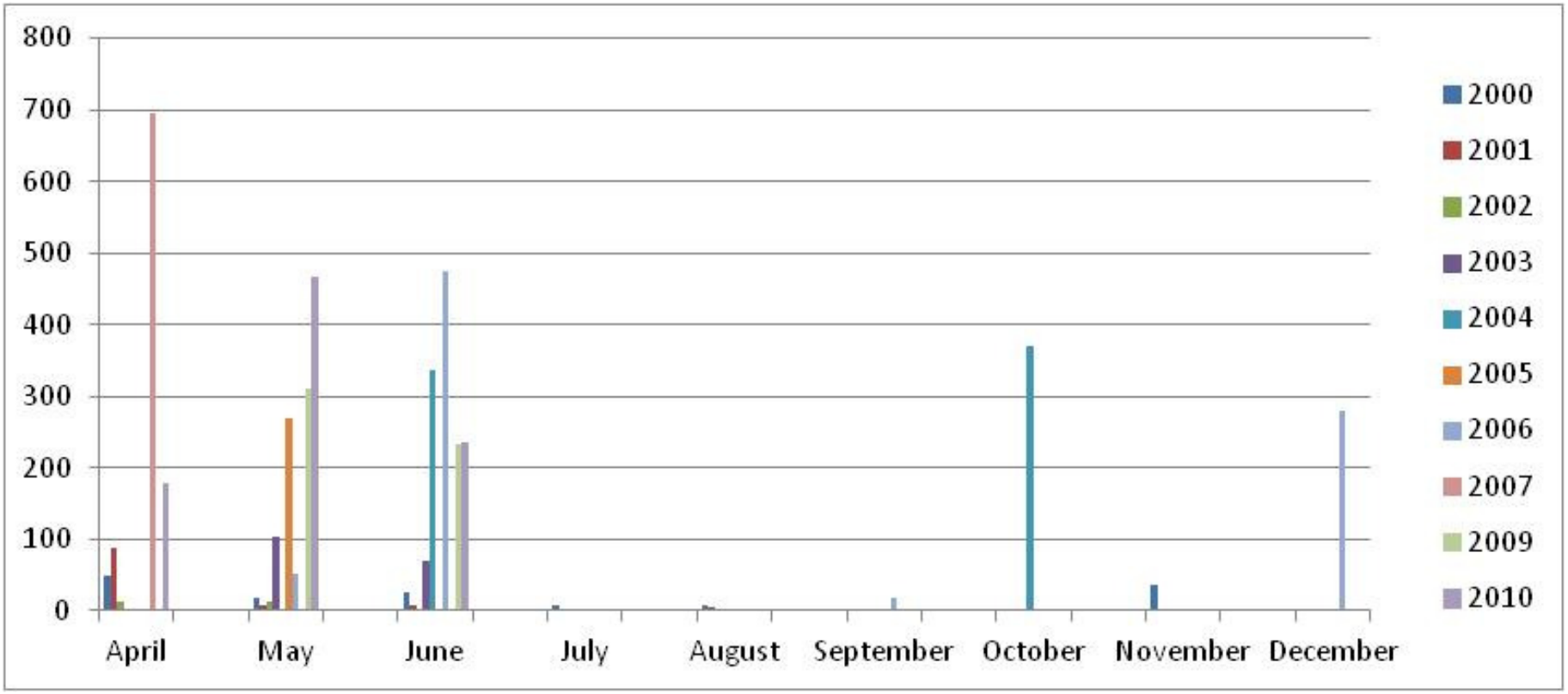
SO_4-S (mg L^{-1}), Seasonal variation

zero tension(median), 20 cm depth



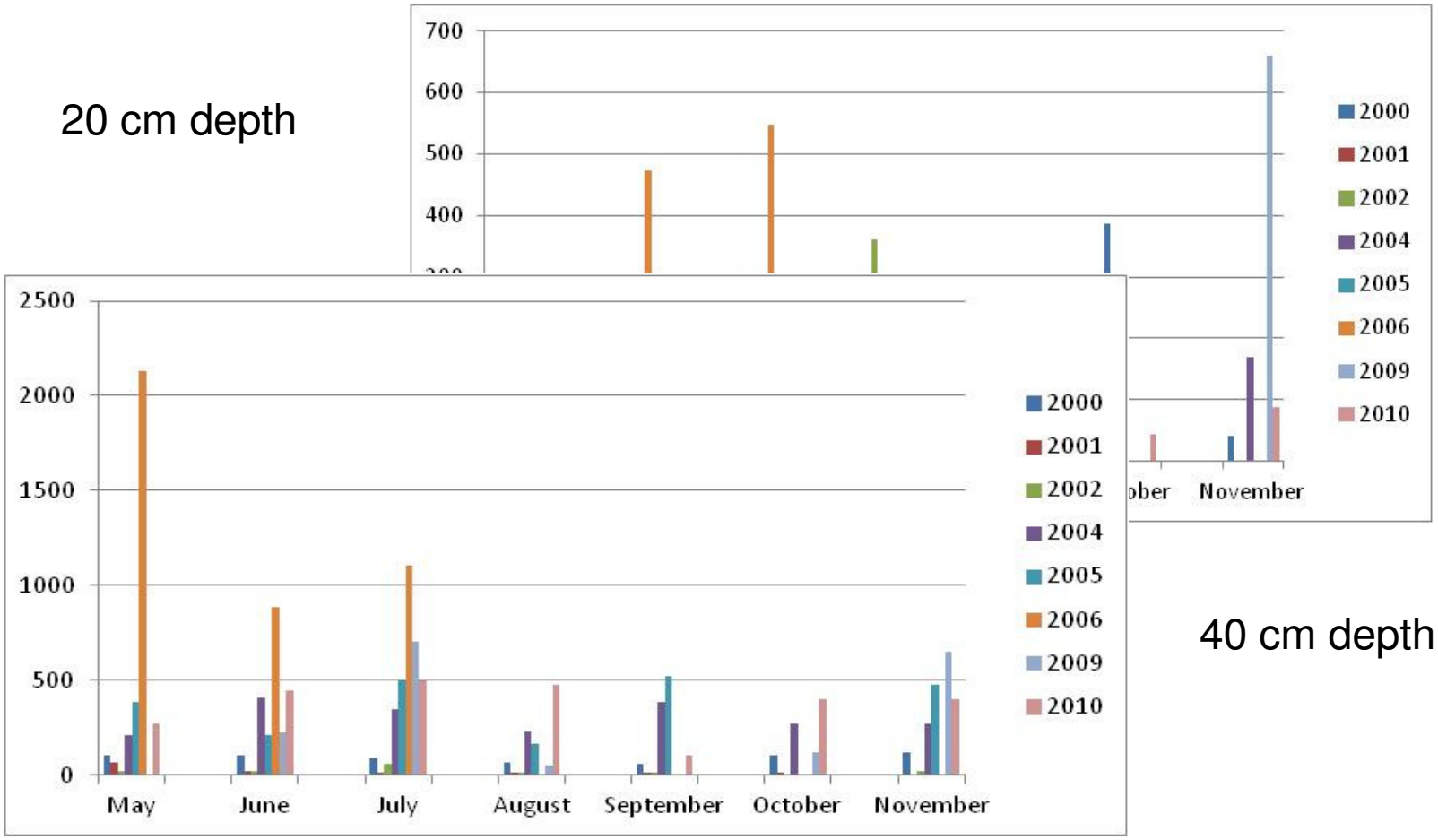
SO_4-S (mg L^{-1}), Seasonal variation

zero tension(median) , 40 cm depth



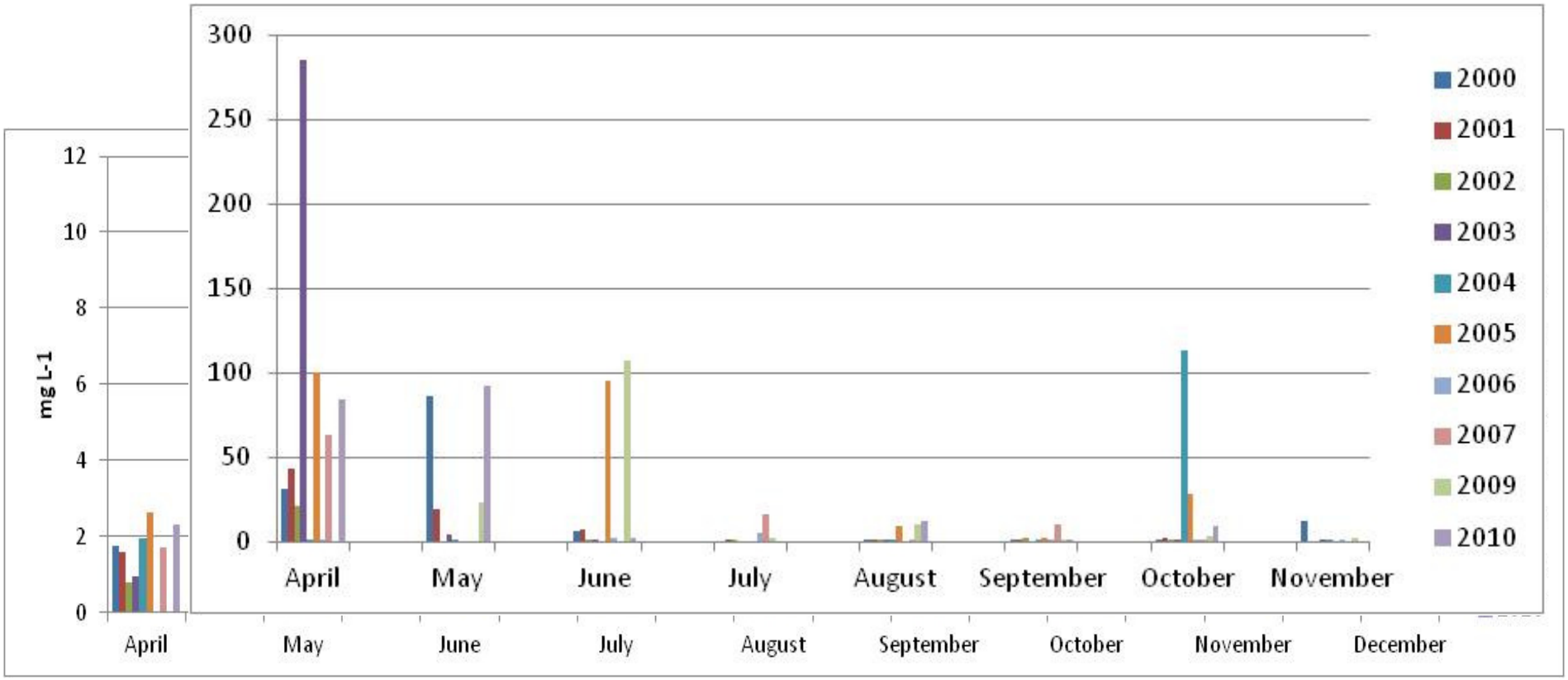
SO_4-S (mg L^{-1}), Seasonal variation, suction cups (median)

20 cm depth



40 cm depth

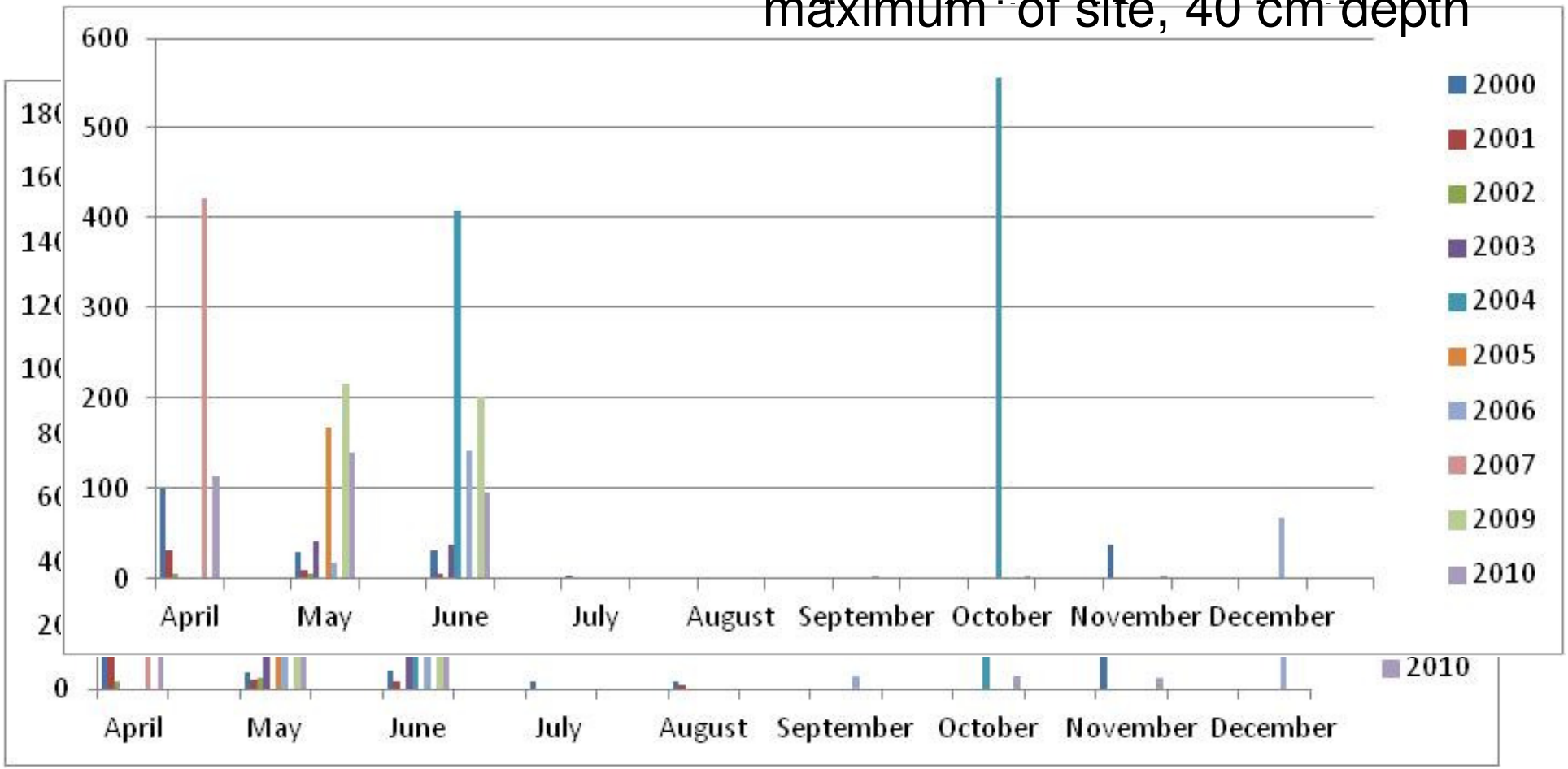
Al (mg L^{-1}), Seasonal variation zero-tension (median)



20 cm depth

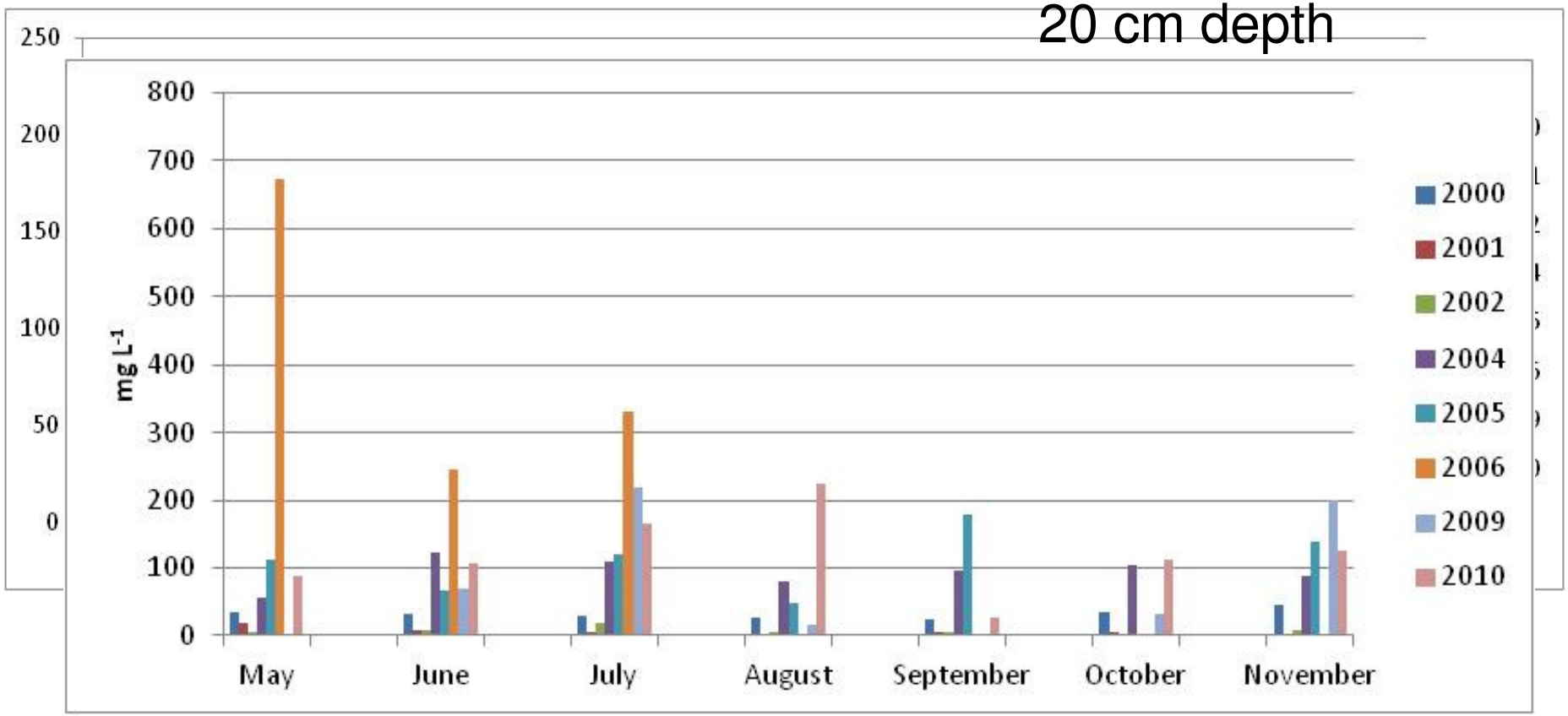
Al (mg L^{-1}), Seasonal variation
zero-tension

maximum of site, 40 cm depth



Al (mg L^{-1}), Seasonal variation suction cups (median)

20 cm depth



40 cm depth

Conclusions

- Elevated concentrations of sulfate and aluminium found in soil solution collected at an undrained forest site
- No clear seasonal pattern can be observed
- High peaks are observed frequently
- No signs of detrimental effects on trees

Thank You!

FUTMON

Metsien seurantaa tulevaisuuden tarpeisiin