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Estimating uncertainties in base cation weathering rates according to mass balance

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Because forestry is often allocated to soils with low weathering capacity, intensive harvesting practices may deteriorate plant nutrition. Reliable estimates of weathering rates are therefore crucial in analyses of sustainability of, e.g., whole-tree and stump harvesting. By the mass balance approach present base cation cycling may be estimated from data on leaching, deposition, and accumulation in biomass and soil. Insight in the uncertainties in the weathering estimates is crucial for the interpretation of the data.

Weathering rate of:	Ca	Mg	K	Na
	(kg ha^{-1} yr^{-1})			
Average	4.0	1.4	3.3	-3.3
Conf. int.	±3.8	±1.6	±4.4	±15

Table 1: Average weathering rates and approximate confidence intervals (ca 95% level) based on spatial variability and uncertainties in allometric functions etc.

Term in balance	Ca	Mg	K	Na
Deposition	8%	43%	2%	26%
ΔK_{exch}	3%	5%	1%	0%
Leaching	4%	28%	0.4%	74%
Biomass accumul	86%	25%	97%	0%

Table 2: Contributions to overall uncertainty in weathering rates according to soil balance.

The present study was carried out in a Norway spruce (*Picea abies* Karst. (L.)) stand on a podzolic soil in SW Sweden. The results pinpoint the difficulty in assessing low weathering rates in general (Table 1), and demonstrates that the influence of the different terms of the balance varies considerably among the different base cations (Table 2). Details of the uncertainty contributions in the different terms of the balance is shown on a poster with the same title.