Chemical composition and colloidal properties of dissolved organic matter in Norway spruce forest stands of different ages

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# Soil sampling

### Tönnersjöhedens experimental area in south-west Sweden

- organic layer (+ forest litter)
- 3 forest and 3 adjacent field soils
- 90 year chronosequence of Norwegian spruce forests (*Picea abies*)



### Spruce forest





Hot DOM extraction: 100°C, 200 nm filter

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## DOM HOT extract, elemental analysis



Forest DOM  $\rightarrow$  more acidic



### Decomposition rate $\searrow$ in forest soils



## Spectroscopy analysis: <sup>1</sup>H NMR



Main fraction of DOM  $\rightarrow$  carbohydrates  $\simeq$  60 %



# Spectroscopy analysis: $^{13}C$ NMR & IR



Dynamic Light Scattering (DLS) & zeta-potential



## SAXS



## Conclusions

#### Chemical structure

- <sup>1</sup>H NMR,<sup>13</sup>C NMR and IR showed that field and forest DOM have strikingly similar chemical composition
- Forest and field hot DOM consist mainly of carbohydrates
- Forest DOM is more acidic, contain more organic carbon than field DOM
- No particular difference in forest DOM extracts of different ages of the forest stand

#### $Colloidal\ structure$

- $\bullet\,$  Size of colloidal DOM  $\simeq$  100 nm, expected from the size of the filter
- $\bullet$  Zeta-potential is negative  $\cong$  -10 mV; colloids are unstable/marginally stable
- SAXS profiles of forest and field DOM are similar. Proposed SAXS model: cellulose cluster + semi-flexible polymer coils.

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DOM PROPERTIES