Quantification of C and N trace gas fluxes from a drained peatland forest in Finland using different measuring techniques


Background:
- 30% of Finnish timber production occurs on drained peatlands
- Drainage of peatlands results in lowering of groundwater table (app. 40 cm) and, thus, in a dramatic change of soil environmental conditions (e.g. soil water, aeration) with impacts on C and N turnover and associated GHG exchange

Hypothesis:
- Drained peatland forests are high emitters of N₂O
- N₂O makes up an important part of the ecosystem GHG exchange
- N₂O fluxes measured by EC in the interstem section should be comparable to the N₂O fluxes measured by closed chamber method

Measuring equipment:
- Automatic chamber measurements
  - Valve driven automatic sampling system, (IMK-IFU)
  - 9 Measuring chambers (50x50x15 cm), (IMK-IFU)
  - Gas chromatograph equipped with 63Ni ECD for N₂O, (SRI)
  - GMD200 Infrared analyzer for CO₂, (Vaisala)
- EC flux measurements
  - CSAT3 Sonic Anemometer, (Campbell Sc.)
  - Li-7500 Open-Path Infrared CO₂/H₂O Gas Analyzer, (Li-Cor Inc.)
  - TDL-TGA100A for N₂O, (Campbell Sc.)

Conclusions:
- The drained peatland forest (app. after 40 years of drainage impact) was not a high source of N₂O, but frost thaw-event driven N₂O emissions can contribute to annual fluxes.
- At current stage N₂O is an insignificant component of the total GHG budget of this site and CO₂ is the main controlling component. However, this might be different by regarding a full cycle from drainage to first harvest of timber.
- Due to the combination of low N₂O emission levels and insufficient turbulent conditions EC-TDL based N₂O emission measurements are highly uncertain. However, EC based CO₂ emissions compared better with chamber based measurements.

Contact information: Ralf.Kiese@imk.fzk.de