Trace gas exchange at the forest floor

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Challenges
- The determination of surface fluxes of the reactive trace gases NO, NO2, and O3 at the forest floor requires consideration of characteristic turbulent timescales and (photo-) chemical interconversions
- Using a flux-gradient approach for chemically inert tracers, such as the radioactive noble gas radon (Rn) and CO2, the turbulent transport regime may be characterized

References

Results
- radon method can be used to characterize near-surface gas exchange, even under conditions of (very) low turbulence
- during advection events CO2 gradients are more robust than Rn gradients
- calculated turbulent surface fluxes of NO are compared to simultaneously performed surface flux measurements by dynamic soil chambers (DCS)
- both methods show upward turbulent NO fluxes during night-time and downward turbulent fluxes in the daytime, especially during periods with strong instanatnaries

Conclusions and Outlook
- Under stable and very stable conditions, when turbulence is small (u<0.08 m s-1) state-of-the-art methods (e.g., eddy covariance) fail. The presented approach is a first attempt to determine K(z) close to the forest floor. It can be used to characterize near-surface exchange of non-reactive and reactive trace gases.
- Four-point gradient measurement of Rn and highly resolved vertical temperature profile during Intensive Observation Periods give first hints that decoupled layers exist within the first meter
- further evaluation is necessary
- Downward turbulent NO fluxes cannot be explained by instanatnaries alone
- compensation point of NO in the O-horizon was ~4-7ppb. Can c(0)<(0) be higher?