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Fluxes of reactive and non-reactive trace gases close to the forest floor

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During the experiment EGER, which took place at Weidenbrunnen site (50˚08'31" N, 11˚52'01" E, 775 m a.s.l.) in the Fichtelgebirge, a Bavarian spruce forest, in July-October 2007 and May-July 2008 respectively, the University of Bayreuth and the Max Planck Institute for Chemistry investigated i.a. vertical concentration and flux profiles of both reactive (NO, NO_2, O_3) and non-reactive (CO_2, H_2O) trace gases at the forest floor – trunk space interface.

The two radon isotopes ^{220}Rn and ^{222}Rn also were essential to measure due to its property of being chemical inert and unaffected by the biosphere. That allows argumentation about interactions with the biosphere and chemical reactions of the other trace gases. The vertical distribution of the short-lived isotope ^{220}Rn ($T_{1/2}$ = 55.6s) affords in combination with the decay constant (0.0125 s^{-1}) the determination of vertical bulk turbulent transfer velocities (v_{tr}). These, in turn, can be compared with characteristic times of atmospheric reactions of NO, NO_2 and O_3 and make validation of derived Damköhler numbers come true.

Surface flux measurement by a static chamber of the longer-lived isotope ^{222}Rn ($T_{1/2}$ = 3.8 d) in combination with the vertical radon profile, provides a real measured profile of turbulent diffusion coefficients.

Along with common meteorological parameters a basis for further investigation with two different implemented model types - hydrodynamical multilayer models and the Louis parameterisation is formed. These models actually represent fluxes of momentum, sensible and latent heat but scalar similarity theory makes the transfer to trace gas flux parameterisation possible.