



Topic for master thesis:

Identification of sources for sulfur (S) supply in forest ecosystems

Sulfate deposition with acid rain was a serious problem for forest ecosystems in Central Europe during the 1970-90s causing severe impacts on forest ecosystems. In the following decades, it was assumed that S availability in European forests is sufficient and, thus, not a problem. Nevertheless, recent reports of clearly decreased S stocks in forest soils and of reduced S foliar contents point to the potential of S deficiencies in European forests. Until the early/mid 1990s, terrestrial systems retained sulfate, but shifted towards net release since the late 1990s, possibly due to mobilization of legacy S pools of former deposited atmospheric S. The national forest soil inventory in Germany (BZE) indicated a considerable decrease of S stocks in the forest floor (O-layer) and of sulfate in soil solution between the first inventory in the early 1990s and the second inventory in 2006/08. Consequently, the S nutritional status in forest ecosystems is increasingly relying on internal S cycling (from mineralization) and S supply from mineral sources. An approach to gain insights both in tree-internal and ecosystem-level S cycling is to measure stable S isotopes in the different compartments, because the relative abundance of certain S isotopes (^{34}S) can be related to specific S sources for forest nutrition.

The main objective of the proposed master thesis is to differentiate sources for S supply in different forest ecosystems by determining the abundance of the stable ^{34}S isotope ($\delta^{34}\text{S}$) in trees and soils. Especially for sites with former very high atmospheric S deposition, it is unclear how S cycling and tree nutrition may have changed within the last decades. In the master thesis, such sites (Erzgebirge) will be compared to a low-input site (Schwarzwald). The analysis of S isotopes will be conducted using Isotope Ratio Mass Spectrometer (IRMS MAT 253, Thermo Fisher Scientific) in cooperation with the Institute of Groundwater Management at TU Dresden.

Literature:

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- Wellbrock N, Bolte A, Flessa H (Eds) (2016) *Dynamik und räumliche Muster forstlicher Standorte in Deutschland: Ergebnisse der Bodenzustandserhebung im Wald 2006 bis 2008*. Johann Heinrich von Thünen Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries

Bertreuer: Dr. Jeroen Zethof, Dr. Dorit Julich, Prof. Karl-Heinz Feger

Kontakt: Dr. Jeroen Zethof, jeroen.zethof@tu-dresden.de, Tel.: 0351-463 31391

Postadresse (Briefe)

Postfach 1117, 01735 Tharandt

Postadresse (Pakete u.ä.)

Piennner Straße 19, 01737 Tharandt

Besucheradresse

Sekretariat: Piennner Straße 19, 2. Etage, Zi. 2.29

Internet

<http://boku.forst.tu-dresden.de/>

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