Master-Thesis

Microclimatic Influence on Greenhouse Gas-Converting Microbial Populations in Transition Zones of Landscape Elements

1. Scientific Background

The global area covered by forests has been decreased due to deforestation and intrusion of agricultural land for ages (FAO, 2012). Nowadays, the area of contiguous intact forest decreases twice as fast as the total forest area (Riitters et al., 2015). Fragmentation of forests leads to biome patches with zones of transition in between them. Within these transition zones matter cycling is altered by changed microclimate (Laurance et al., 2007, 2011; Nascimento and Laurance, 2004). Organisms respond positively or negatively to the changes in microclimate caused by fragmentation (Godefroid et al., 2006; Heithecker and Halpern, 2007; Magnago et al., 2015).

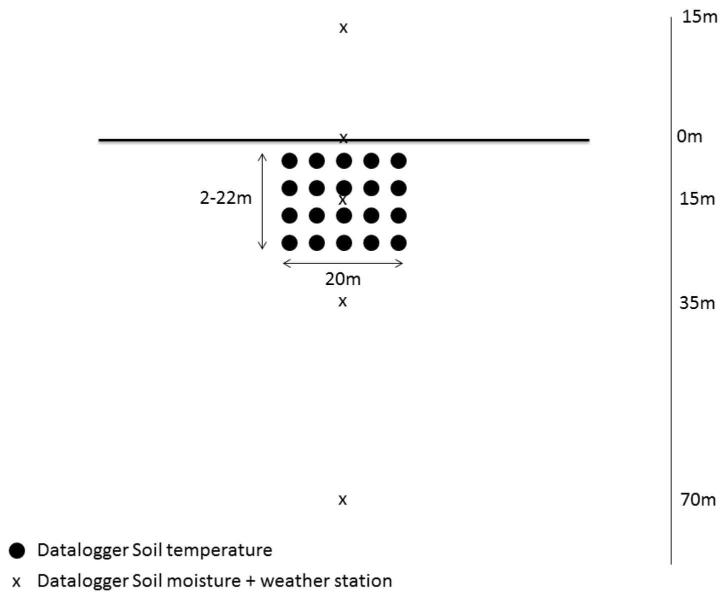
Forested transition zones are reported as ‘hotspots’ for nitrogen (N) deposition and acidification because of local advection, turbulent wind flow and inflow (De Schrijver et al., 2007; Devlaeminck et al., 2005). Atmospheric deposition is reported to be higher in transition zones and can reach approximately 100 m into the forest (Ould-Dada et al., 2002; Wuyts et al., 2008).

Soil moisture and temperature are significantly altered in forest transition zones within a distance of approximately 25 m. The importance of soil microorganisms for N cycling is well known as well as they are important sources (nitrous oxide; N_2O) and sinks for (e.g. methane) of green house gases. The correlation of their metabolism with temperature and soil moisture is likely. (e.g. Moyano et al., 2008; Riutta et al., 2012; Knief, 2015; Kolb, 2009).

In the Master thesis project you will determine the influence of microclimate – i.e. the global radiation, air and soil moisture as well as temperature – in forested transition zones on the potential activities and community structure of N_2O producing and methane-consuming microorganisms.

2. Hypothesis

We expect that along the microclimatic gradient both the genetic diversity as well as the potential activities of greenhouse gas-converting microorganisms change and potential activities of N_2O producers increase in the transition zone compared to adjacent forested area.



3. Proposed Methods

The measurements will be conducted at two forested (*Pinus sylvestris, Larix decidua*) transition zones between the landscape elements forest and agriculture in Brandenburg, NE Germany – one is east-facing and one west-facing. In a transect (Figure), soil moisture sensors and weather stations are installed. In addition, 20 soil temperature loggers per site will be embed in a raster. In this area, soil samples will be taken 4 to 6 times during an one year measurement period starting in October or November 2016. The samples will be analyzed for abundance and diversity of greenhouse gas-converting microorganisms employing high throughput sequencing, quantitative PCR, and and gene marker analysis.

4. Contact

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5. Literature to study

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