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Significant changes in the ground vegetation along an environmental gradient across German forests: results from the intensive forest monitoring sites

Poster

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Abstract

Intensive forest monitoring (Level II) offers a huge data basis to study cause-effect-relationships in forest ecosystems. As part of the European ICP Forests programme, assessments of environmental parameters and the state of forests have been conducted on over 100 intensive monitoring sites according to harmonized methods. In 2012, 68 Level II sites were selected as an official German set of intensive monitoring sites, based on different environmental variable (the pH value of the upper mineral soil, yearly precipitation sums, long-term N-NH4 deposition as well as altitude). The 68 sites represent different environmental gradients common for the main forest ecosystems in Germany. Here we analysed which environmental variables most significantly affect the composition of the ground vegetation and whether changes in environmental gradients can be linked to those in the composition of ground vegetation.

The pH value in the upper soil ranges between 3.3 and 7.6. Compared to a 2001-2005 reference period, we have observed a slight but significant increase. Yearly precipitation sums are between 460 to 2040 mm a-1. In the observation period 2016-2020, N-NH4 deposition ranged between 3 and 15 kg ha-1 a-1. It has decreased by about 20% since 2001.

Preliminary results show a shift in the ground vegetation towards species with a lower Ellenberg N index, lower Ellenberg K index, as well as a significant increase in C-score and a significant decrease in R-score. Shannon index significantly decreased over the last twenty years. At the spatial scale, Ellenberg N can be linked to foliar nutrition: mean Ellenberg N index is highest at sites where foliar N is above critical limits. Mean Ellenberg K index shows a significant negative relationship with yearly precipitation sums. CSR signature shows significant links with soil pH as well as precipitation sums, mean temperature, and length of the vegetation period, e.g. variables that are influenced by ongoing global change.