Geophysical Research Abstracts
Vol. 20, EGU2018-15536-2, 2018
EGU General Assembly 2018

Land-use legacies affect forest herbs under global change: a large-scaled multi-factor experiment

Haben Blondeel

Ghent University, Faculty of Bioscience Engineering, Forest & Nature Lab, Belgium (haben.blondeel@ugent.be)

Herbaceous communities represent a key part of functional biodiversity in forests and are often reflective of past, as well as current, ecosystem conditions. This is particularly the case in temperate biomes, where changing land management had led to reforestation of agricultural land. When present, legacies of past agricultural activities could be enhanced or diminished in interaction with other environmental drivers such as climate change, nitrogen (N) deposition and changes in light availability through current forest management. We present that these legacy effects, in interaction with environmental changes, shape plant communities. To test this idea, we developed a large multi-factor field experiment to disentangle interactive effects of forest land-use legacies, climate warming, enhanced N-availability and increased light availability on understorey communities. We collected soil from paired post-agricultural and ancient forests along wide temperature and N deposition gradients across Europe and translocated them to our test site in Gontrode, Belgium. Here we created 384 mesocosms by planting communities of widespread forest herbs based on their functional traits. These mesocosms were subsequently exposed to factorial treatments of warming, N -addition and illumination using fluorescent tubes. Phosphorus levels were highest in soils where previous agricultural practices had been most intensive, while cumulative N deposition has driven soil acidification. These legacy effects clearly interacted with the environmental treatments to affect plant community performance. Functional trait responses were commonly determined by interactions, reflecting ecological strategies of vernal flora in particular. Plant performance was affected by changes in herbivory patterns as well, which was more pronounced when adding N to soils with recent agricultural history. Overall, biomass production was elevated with light addition, an effect that was exacerbated by warming. These results suggest that a thorough knowledge of the forest ecosystem is key to adaptively manage forest biodiversity in the light of global change.