Geophysical Research Abstracts
Vol. 18, EGU2016-17876, 2016
EGU General Assembly 2016

Impact of anthropogenic induced nitrogen input and liming on phosphorous leaching in forest soils

Stefan Holzmann, Heike Puhlmann, and Klaus Wilpert

Dep. of Soil and Environmen, Forest Research Institute Freiburg, Germany (stefan.holzmann@forst.bwl.de)

Introduction: Phosphorous (P) is essential for sustainable forest growth, yet the impact of anthropogenic impacts on P leaching losses from forest soils are hardly known.
Methods: We conducted an irrigation experiment with 128 mesocosms of 7.4 cm diameter containing 20 cm mineral soil plus the organic layer from three forest sites representing a gradient of resin extractable P of the A-horizon. On each site we selected a Fagus sylvatica and a Picea abies managed subsite. Half of the cylinders where planted with seedlings of the respective species to access the plant impact. We simulated ambient rain (AR), anthropogenic nitrogen input (NI) of 100 kg/ha/a and forest liming (FL) with a dolomite input of 0.3 Mg/ha/a. Soil solution was extracted from the organic layer and at 20 cm depth. We collected the soil solution over a period of 13.5 months and analyzed it separated by 5 periods. The soil solution was analyzed for total phosphorous (TP) by measuring the molybdane reactive phosphorous after acid digestion. To analyze the multivariate dataset we applied random forest modelling and used partial (co-)dependency plots to interpret the results.
Results: The TP content of the soil solution from the organic horizon was approximately ten times higher than the soil solution content of the mineral soil. The NI treatment did increase the TP content on all sites. The increase was more pronounced in the organic layer than in the mineral layer. The FL treatment lead to a slight increase of TP in the organic layer while we could observe a slight decrease in the mineral horizon. Both the organic layer and the mineral horizon showed a seasonal cycle with the exception of one Picea abies subsite which displayed a constant increase in TP in the organic layer. The seasonal cycle of the organic horizon had a minimum during the period of April to July, while the minimum at the mineral horizon was during November to January.
Conclusion: TP in the soil solution is highest in the organic layer and rapidly diminishes in the mineral soil. NI leads to a strong increase of TP in the soil solution thus increasing the leaching potential significantly. At the beginning of the vegetation season the organic layer shows a minimum of TP in the solution, we assume due to assimilation of plants and microorganisms. The winter minimum in the mineral soil is caused presumably by dilution, since during the winter time the throw flow of the precipitated water is not diminished by plant transpiration.