



Leaching of natural colloids from forest topsoils and their relevance for phosphorus mobility

Anna Missong (1), Stefan Holzmann (2), Roland Bol (1), Volker Nischwitz (3), Heike Puhlmann (2), Klaus v. Wilpert (2), Jan Siemens (4), and Erwin Klumpp (1)

(1) Institute of Bio- and Geosciences (IBG-3), Forschungszentrum Jülich, Jülich, Germany (a.missong@fz-juelich.de), (2) Forstliche Versuchs- und Forschungsanstalt Baden-Württemberg, Freiburg, Germany (Stefan_Holzmann@gmx.net), (3) Central Institute for Engineering, Electronics and Analytics (ZEA-3), Forschungszentrum Jülich, Jülich, Germany (v.nischwitz@fz-juelich.de), (4) Institute for Soil Science and Soil Conservation, Justus Liebig University Giessen, Giessen, Germany (Jan.Siemens@umwelt.uni-giessen.de)

The leaching of P from the upper 20 cm of forest topsoils influences nutrient (re-)cycling and the redistribution of available phosphate and organic P forms. However, the effective leaching of colloids and potentially associated P forms from forest topsoils was so far sparsely investigated. In this study we demonstrated through irrigation experiments with undisturbed mesocosm soil columns, that significant proportions of P leached from acidic forest topsoils were associated with natural colloids up to a size of 400 nm. By means of Field-flow fractionation the leached soil colloids could be separated into three size fractions. The size and composition was comparable to colloids present in acidic forest streams known from literature. The composition of leached colloids of the three size classes was dominated by organic carbon. Furthermore, these colloids contained large concentrations of P which amounted between 12-91% of the totally leached P depending on the type of the forest soil. However, the proportion of colloid-associated P decreased with increasing total P leaching. Leaching of total and colloid-associated P from the forest surface soil did not increase with increasing bulk soil P concentrations and were also not related to tree species. The present study highlighted that colloid-facilitated P leaching can be of higher relevance for the P leaching from forest surface soils than dissolved P and should not be neglected in soil water flux studies.