



## **Dynamics of Phosphorus export from small forested catchments in low mountain ranges in Germany**

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Phosphorus (P) plays an important role in the nutrition of forest ecosystem. The transport of P in forest soils predominantly occurs along preferential water flow pathways bypassing large parts of the soil matrix. Therefore, rapid flow processes by preferential flow and/or during storm events may lead to significant P losses from forest soils. However only little knowledge about the dynamics, magnitude and driving processes of P exports into surface water exist.

In this contribution, we present the results of two studies where two small forested catchments have been monitored for a period around 3 years. Both catchments are situated in low mountain ranges in Saxony (catchment size 21 ha) and Thuringia (catchment size 5 ha) representing medium P contents in the topsoil of 1142 mg kg<sup>-1</sup> and 834 mg kg<sup>-1</sup> respectively. During the regular sampling (monthly to weekly sampling frequency), the mean Total-P concentrations of 23 μg L<sup>-1</sup>(Thuringian Site) and 8 μg L<sup>-1</sup>(Saxonian Site) have been measured. However, during single storm events Total-P concentrations increased considerably with maximum concentrations of 134 μg L<sup>-1</sup>(Thuringian Site) and 203 μg L<sup>-1</sup>(Saxonian Site). Our findings indicate that during storm events, especially after longer dry periods, significant amounts of phosphorus can be exported from forest ecosystems. Comparison of discharge-concentration patterns of Total-P, Nitrogen and DOC, as well as dye tracer experiments, suggest that preferential flow along biopores and stone surfaces, and the interface between mineral soil and litter layer are main pathways of export from forests.

For the site in Saxony we calculated mean annual export rates of 32.8 to 33.5 g ha<sup>-1</sup> a<sup>-1</sup> based on the weekly sampling with different load calculation methods (flow weighted methods up to linear regression models). If the events are included into the annual load calculation the mean annual export fluxes increase from 47.8 to 58.6 g ha<sup>-1</sup> a<sup>-1</sup> based on the different load calculation methods. This implies that the estimation of P-exports from forested catchments need to be based on appropriate monitoring schemes and load estimation methods.