Effects of extreme events on nitrogen export from forested ecosystems: a review

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The effects of the extreme event on the nitrogen (N) export from forested catchments are important factors for comprehensive understandings on the mechanisms of ecosystem disturbances and recovery and its prediction under global climate change. Previous related studies on this topic have consisted of many case studies with field observational approach and several prediction studies using simulation models and climate change scenario. Observational studies can be classified roughly into following three categories depending on the degree of the disturbance on ecosystem structures and functions:
1) Cases without geomorphological and biogeochemical disturbances: Structures and functions of catchment ecosystem are not disturbed, although high flow conditions occurs.
2) Cases without geomorphological disturbances, but with biogeochemical disturbances such as the changes in N pool size in soils: Structures and functions of catchment ecosystem are altered but those are recoverable within certain time period.
3) Cases with geomorphological disturbances in addition to biogeochemical disturbances: Structures and functions of catchment ecosystem are irreversibly disturbed by landslide and debris flow.
These variations also depend upon the vulnerability of the catchment structures in aspects of biological and geomorphological properties.
Previously, field researches have scarcely been conducted on the type 3 in the N export context, while many case studies for the types 1 and 2 have been previously performed in temperate regions. The major N form during storm events are determined if the movable pool is dissolved or particulate forms, and spatial distributions of those relative to the pathways of direct runoff. However, the evidencing studies on disturbance of the extreme storm events on the N dynamics (transformations and pool size changes) itself are still limited. Predictive studies have previously been conducted only in the non-monsoon regions of North America. More conditional variations, such as seasonal precipitation patterns, will be needed for future projections of the ecosystem responses in global scale perspective.

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