PROJECT FACTSHEET

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EFFECT

Integrating the spatiotemporal effects of vegetation water uptake on catchment travel-times and runoff generation processes.

Inspiration

The understanding of hydrological processes are essential for ensuring an efficient water management regarding the sustainability use and quality of water resources. The variability in space and time of such processes has been widely investigated and simulated with catchment travel-times to describe stream flows. However, the current practice does not integrate the effect of the vegetation water uptake in catchment travel time simulation. Moreover, there is only a little understanding and even less data on the actual water uptake of trees.
In the light of global change impacts on water resources, there is a pressing need for a better understanding of hydrological processes. The spatial and temporal pattern of vegetation water uptake and its effects on catchment travel-times should be integrated into the current theory.

Innovation

EFFECT builds on past and current research carried out within a number of projects by the Luxembourg Institute of Science and Technology (LIST). The project aims to bring a new insight into the hydrological systems understanding with the investigation of vegetation water uptake to enable a robust simulation of streamflow.
The LIST team will perform field experiments in the Weierbach research catchment in NW Luxembourg to identify the age of stream water and tree water over time with isotopic signals (Oxygen and Hydrogen). This project will also bring an innovative approach by determining the isotopic composition of the water that is flowing in the trees sampled over the same time.
The researcher team, together with international partners, will thus be able to characterize the water origins of vegetation (e.g. ground water, soils) and their proportions over time, allowing understanding of the spatial and temporal pattern thereof. Those datasets will then be implemented in a mathematical framework. This framework will enable to know the water age of the trees, their average water uptake, as well as the catchment travel-time and the effect on the simulation of the stream flow.

Impact

As a fundamental research project, EFFECT will enable a better understanding of both hydrological and vegetation systems, but EFFECT will contribute to new theory that integrates the spatial and temporal aspects of the water uptakes by vegetation.
The project will contribute to improve the knowledge and predictions on veco-hydrological and hydrological processes and vegetation impacts on the amount and travel-time of water in the stream, and thus eventually of the chemical composition of stream water.
In a next step, the understanding resulting from EFFECT could be from high interest for water and forest management in Luxembourg (e.g. determining the water stress timing of trees).

Partners

Hong Kong Baptist University (HK) , Technical University Delft (NL) , University of Western Australia (AU) , Virginia Tech (US)

Financial Support

Fonds National de la Recherche

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