PROJECT FACTSHEET

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WAVE

Towards a better understanding and prediction of environmental change consequences on the vegetation and water balance in ecosystems.

Inspiration

Environmental and land use changes are major concerns for the scientific community, which tries to establish reasonable predictions of their consequences for ecosystems and water resources. When facing pressures such as climate change or deforestation, vegetation is subject to many physical constraints, within which plants must adjust their functioning, including their interactions with water resources.

The current modelling of mid to long-term vegetation responses, based on limited observation data sets, plays a key role for the understanding of environmental change impacts. However, common approaches in the scientific literature lack consistent physical underpinnings that are essential for the accuracy of model predictions. In addition, neglect of physical constraints and general principles leads to overfitting of models to observational data, hence preventing the use of data for model testing.

Innovation

In this context, the LIST project aims to provide a better ecohydrological understanding and modelling of the interactions between water and vegetation in a changing environment. To do so, the project follows three inter-dependent research axes.

First, the LIST researchers perform targeted lab and field experiments to better understand physical principles and biological tradeoffs of the main functions of the plants: the roots, the leaves and the water transport organs. They investigate, for example, the gas exchange processes at the leaf level, but also look at what have to be the optimal properties of the roots and water conduits. At the same time, the project team implements physical constraints and optimality hypotheses in models at different scales. The latter are then tested against observations using fully transparent and reproducible workflows.

Beyond its science objectives, WAVE also develops a new collaborative and open approach for the wider field of environmental science: a community-based model and hypothesis evaluation framework.

Impact

With this approach, the WAVE project will enable a better understanding and quantitative representation of the physical processes and biological tradeoffs related to vegetation-environment interactions.

The development of a community-based hypothesis evaluation framework is an initiative that allows fully transparent scientific research following the philosophy of Open Science. Applied to the modelling, it will enable the hydrological community to use a common framework to test the models on a growing body of cutting edge observational data and to evaluate their applicability in a wide range of environmental contexts, a prerequisite for reliable long-term predictions in a changing environment.

This innovative methodology will enable traceable and continuous improvement of model capabilities, eventually allowing to perform robust mid to long-term predictions on the potential consequences of environmental change on ecosystems and water resources.

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