



## **Plant functional coexistence and influence on the eco-hydrologic response of semiarid hillslopes**

Mohammadjafar Soltanjalili, Patricia M. Saco, and Garry Willgoose

The University of Newcastle, School of Engineering, Callaghan, New South Wales, Australia

Through its influence on rainfall-runoff and erosion-deposition processes, vegetation remarkably regulates different aspects of landscape processes. Here, the influence of different plant functional dynamics on the coexistence of different species in arid and semi-arid regions with banded vegetation patterns is investigated. Simulations capture the coevolution and coexistence of two different species interacting with hydrology in hillslopes with gentle slopes. The dynamic vegetation model simulates the dynamics of overland runoff, soil moisture, facilitation mechanisms (evaporation reduction through shading and enhanced infiltration by vegetation), local and non-local seed dispersal, competition through water uptake and changes in the biomass of the two species. Here for simplicity the two species are assumed to use water from the same soil depth. Results of the coexistence of the two species capture differences in facilitation-competition interactions caused by specific types of vegetation with varying hydrologic traits. The results illustrate that the dominance of facilitation or competition feedbacks which determine either the coexistence of the two species or survival of only one of them strongly depends on the characteristics and hydrologic traits of the coexisting species and the severity of water stresses. We therefore argue that our results should stimulate further research into the role of interspecific and intraspecific feedbacks between different plant species and specifically the influence of the resulting vegetation community on landform evolution processes.