Geophysical Research Abstracts
Vol. 18, EGU2016-2383, 2016
EGU General Assembly 2016

Towards integrated approaches to advance understanding of ecohydrological systems across scales

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It is increasingly recognised that the processes and connections in our landscapes are influencing the functioning of aquatic ecosystems. Fundamental scientific understanding of the functioning of both aquatic and terrestrial ecosystems is required for an integrated and sustainable management of landscapes and riverscapes to maintain their ecosystem services and biological integrity at multiple scales. This talk will show how the interactions and feedbacks in ecohydrological systems can be quantitatively assessed through a number of novel, integrated approaches. Importantly, this talk will discuss the need to understand the role of vegetation on water partitioning at the terrestrial and aquatic interface. Terrestrial and aquatic ecosystems are interacting at every scale level and cross-scale investigations are extremely useful to gain an integrated understanding of ecohydrological systems. Environmental tracers are valuable tools to understand the functioning of ecohydrological systems at the landscape scale in terms of understand flow paths, sources of water and associated biogeochemical interactions. Extensive empirical studies were conducted at the plot and hillslope scale to understand ecohydrological systems, and in particular, soil-vegetation-water interlinkages. This empirically based understanding was then integrated into spatially distributed, tracer-aided models to understand mixing of water, flows to the stream and water age distribution at the catchment scale. Finally, remote sensing techniques were used to integrate empirically based findings and to extrapolate system understanding to cross-regional scales, specifically in terms of studying hydroclimatic variability, vegetation dynamics and consequent changes of plant water use and water partitioning.