Geophysical Research Abstracts
Vol. 13, EGU2011-12839, 2011
EGU General Assembly 2011

The role of land-climate interactions and ecohydrological feedbacks for the climate system

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Land-climate interactions associated with soil moisture dynamics play a central role in the climate system (e.g. Seneviratne et al. 2010). Soil moisture constrains plant transpiration and photosynthesis in several regions of the world, with consequent impacts on the water, energy and biogeochemical cycles. Moreover, it is a storage component for precipitation and radiation anomalies, inducing persistence in the climate system. Finally, it is involved in a number of feedbacks at the local, regional and global scales, and plays a major role in climate-change projections. In particular, soil moisture deficits and drought have been identified as key drivers for heat waves (e.g. Seneviratne et al. 2006, Fischer et al. 2007, Hirschi et al. 2011).

In this presentation, we provide perspectives on the role of ecohydrological feedbacks for land-climate interactions. Several soil moisture-vegetation interactions are relevant for ecosystems (e.g. Rietkerk et al. 2004), and these could possibly feed back to climate in some regions (Dekker et al. 2007). However, the complexity of feedbacks between land-atmosphere exchanges and the boundary layer need to be considered in such evaluations. For instance, both positive and negative feedbacks between soil moisture and precipitation, respectively boundary-layer stability, have been reported (e.g. Findell and Eltahir 2003, Ek and Holtslag 2004). This may modulate ecohydrological feedbacks and their relevance for regional climate. On the other hand, land cover type can play an important role for land-atmosphere exchanges (e.g. Teuling et al. 2010), and shifts in vegetation cover are likely affected by small-scale ecohydrological feedbacks in some regions. These various results suggest complex links between local ecohydrological feedbacks and regional land-climate interactions.

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