

Interactive comment on “Pattern, process, and function in landscape ecology and catchment hydrology – how can quantitative landscape ecology support predictions in ungauged basins (PUB)?” by B. Schröder

Anonymous Referee #2

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Paper Title: Pattern, process, and function in landscape ecology and catchment hydrology - how can quantitative landscape ecology support predictions in ungauged basins (PUB)? Author: Boris Schröder

Review comments:

The paper reviews some of the current cross-disciplinary research in the areas of ecohydrology and landscape ecology. The review provides a useful description of many of the recent studies that analyze and model the interrelation between patterns, pro-

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cesses and function.

The paper includes numerous and useful references that are particularly valuable for researchers with a hydrology background. Most of these references and the examples correspond to studies on riverine landscapes (as stated by the author) that are tightly linked to hydrology and therefore relevant for this review. However, the focus on riverine landscapes is a little narrow for the larger scope implicit in the title. For example, the large body of research studies in the area of ecohydrology and landscape ecology of arid and semi-arid regions that would also constitute extremely valuable examples for this review is not mentioned. Though obviously the inclusion of all references to research studies in this area would be unfeasible, some examples drawn from the studies on arid region ecohydrologic research would be particularly useful for this paper. Especially since these studies demonstrate the inescapable need to integrate ecology, hydrology and geomorphology, and the consideration of the underlying self-organized patterns to correctly capture ecohydrologic process behavior and to predict ecohydrological variables of interest to both ecologists and hydrologists.

As shown in numerous studies, vegetation patterns play an important role in determining the location of runoff and sediment source and sink areas in arid and semi-arid regions (Cammeraat and Imeson, 1998; d'Herbes et al., 2001; Dunkerley and Brown, 2002; Tongway and Ludwig, 2001; Valentin et al., 1999; Wilcox et al., 2003; among many others). These patterns are functionally related to hydrologic processes through their effect on soil moisture, runoff and evapotranspiration; and to geomorphologic processes through their role on determining the spatial distribution of erosion-deposition areas (Boer and Puigdefábregas, 2005; Imeson and Prinsen, 2004). Infiltration is enhanced under vegetated patches due to improved soil aggregation and macroporosity related to biological activity (Ludwig et al., 2005) and thus the spatial redistribution of flows and material is regulated by both topography and vegetation and is strongly influenced by the interaction between vegetated and bare patches that is determined by their spatial connectivity (Imeson and Prinsen, 2004).

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Consequently, a brief discussion on these studies and the inclusion of some references would be certainly beneficial in the context of this article, not only to offer a more complete picture of the state-of-the-art research in the interdisciplinary field of ecohydrology to the intended audience, but also to address the problem of prediction in ungaged catchments in arid and semi-arid regions (especially when most catchments in arid and semi-arid regions are usually ungaged).

References (most include the analysis of the inter-relation between pattern, process, and function in arid and semi-arid regions):

Boer, M., and Puigdefábregas, J.: Effects of spatially structured vegetation patterns on hillslope erosion in a semiarid Mediterranean environment: a simulation study, Effects of vegetation patterns on erosion, *Earth Surface Processes and Landforms*, 30, 149-167, 2005.

Cammeraat, L. H, and Imeson, A. C.: The evolution and significance of soil-vegetation patterns following land abandonment and fire in Spain, *Catena*, 37(1-2), 107-127, 1999.

d'Herbes, J. M, Valentin, C., Tongway, D., and Leprun, J. C.: Banded Vegetation Patterns and related Structures, in *Banded vegetation patterning in arid and semiarid environments: ecological processes and consequences for management*, *Ecological studies* 149, Springer-Verlag, New York, USA, 1-19, 2001.

Dunkerley, D.L., and Brown, K.J.: Oblique vegetation banding in the Australian arid zone: implications for theories of pattern evolution and maintenance, *Journal of Arid Environments*, 51, 163-181, 2002.

Imeson, A. C., and Prinsen, H. A. M.: Vegetation patterns as biological indicators for identifying runoff and sediment source and sink areas for semi-arid landscapes in Spain, *Agriculture, Ecosystems and Environment*, 104, 333-342, 2004.

Ludwig, J. A., Wilcox, B. P., Breshears, D. D., Tongway, D. J., and Imeson, A. C.: Vege-

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tation patches and runoff-erosion as interacting ecohydrological processes in semiarid landscapes, *Ecology*, 86(2): 288-297, 2005. (This ref. is already in the paper)

Tongway, D. J., and Ludwig, J. A.: Theories on the origins, maintenance, dynamics, and functioning of banded landscapes, in *Banded vegetation patterning in arid and semiarid environments: ecological processes and consequences for management*, *Ecological studies* 149, Springer-Verlag, New York, USA, 20-31, 2001.

Valentin, C., d'Herbes, J. M., and Poesen, J.: Soil and water components of banded vegetation patterns, *Catena*, 37, 1-24, 1999.

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