Hydrol. Earth Syst. Sci. Discuss., 3, S963–S967, 2006
www.hydrol-earth-syst-sci-discuss.net/3/S963/2006/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Pattern, process, and function in landscape ecology and catchment hydrology – how canquantitative landscape ecology support predictions in ungauged basins (PUB)?" *by* B. Schröder

B. Schröder

boschroe@uni-potsdam.de

Received and published: 20 September 2006

Many thanks for these constructive comments on the ms. Please find my replies on specific topics below:

Bias towards presenting examples from landscape ecology and applying them on to hydrology

This bias is due to the discussion between the author and several hydrologists underlying this manuscript. As a landscape ecologist, who already applies hydrological models to improve ecological predictions (see example 2; Rudner et al. in press; Schröder et al. 2004), the reverse question - how can landscape ecology improve hydrological predictions? - seemed to be more challenging (but see Schröder and Seppelt in press). Naturally, I'm more familiar with landscape ecological concepts. I hope that this bias will be removed due to the revision with respect to ecohydrological research in semi-arid landscapes which was suggested by the other two reviewers.

Structure in section 2

This part of the manuscript will be restructured and changed according to the suggestions of all reviewers. Adding a further section on ecohydrological research in semi-arid landscapes will improve and broaden the focus of the review. Additional examples will shift the focus from patterns to processes and feedbacks, and offer a more complete picture of the state-of-the-art research in the interdisciplinary field of ecohydrology - as suggested by all three reviewers. They will also more substantially represent integrated process-based models and reveal their relevance.

Figure 2

Fig. 2 shows how the consideration of predictors related to hydrology - such as the amount of plant available water - improves model performance in terms of model calibration (R2N) and discrimination (AUC) depending on model complexity (i.e. the number of predictors variables). The presented scatterplot reveals that both performance criteria are improved. This improvement is i) higher for simpler models and ii) higher than could be expected due the increasing model complexity and related additional information. There is some additional information necessary to understand the figure that is presented in the referred paper (Rudner et al. in press, Schröder et al subm.) but will be given in the revised ms. As an additional information species names will be given. To make the figure easier to interpret, I'll present only one performance criterion (R2N) as a bar plot. It should be noted that only 15 out of 50 species significantly depend on plant available water, i.e. 35 may do in the univariate case but not in the

HESSD

3, S963–S967, 2006

Interactive Comment

multiple models. The underlying overall model performance is considerably high. The example will be accompanied by comparable studies using hydrological information for the prediction of species or species richness distribution (e.g. Zinko et al. 2005 or large-scale bioclimatic species distribution models, e.g. Araújo et al. 2005).

Wavelets

Wavelets receive increasing awareness in landscape ecology (see below) as well as in hydrology (see Gaucherel 2002; Labat 2005; Markovic and Koch 2005; Si and Zeleke 2005). Instead of extending this section by methodological issues, I will replace some of the cited references and refer to wavelet-related references in the landscape ecological literature (Bradshaw and Spies 1992; Camarero et al. 2006, Keitt 2000; Keitt and Urban 2005; Saunders et al. 1998; Schröder and Seppelt in press).

All suggestions concerning title, subtitles and structure in section 2, spelling and style will be taken into account in the revised manuscript.

References

Araújo, M. B., Whittaker, R. J., Ladle, R. J. and Erhard, M., 2005. Reducing uncertainty in projections of extinction risk from climate change. Global Ecol. Biogeogr. 14: 529-538.

Bradshaw, G. A. and Spies, T. A., 1992. Characterizing canopy gap structure in forests using wavelet analysis. J. Ecol. 80: 205-215.

Camarero, J. J., Gutiérrez, E. and Fortin, M.-J., 2006. Spatial patterns of plant richness across treeline ecotones in the Pyrenees reveal different locations for richness and tree cover boundaries. Global Ecol. Biogeogr. 15: 182-191.

Gaucherel, C., 2002. Use of wavelet transform for temporal characterisation of remote watersheds. J. Hydrol. 260: 101-121.

Keitt, T. H., 2000. Spectral representation of neutral landscapes. Landscape Ecol. 15:

479-493.

Keitt, T. H. and Urban, D. L., 2005. Scale-specific inference using wavelets. Ecology 86: 2497-2504..

Labat, D., 2005. Recent advances in wavelet analyses: Part 1. A review of concepts. J. Hydrol. 314: 275-288.

Markovic, D. and Koch, M., 2005. Wavelet and scaling analysis of monthly precipitation extremes in Germany in the 20th century: Interannual to interdecadal oscillations and the North Atlantic Oscillation influence. Water Resour. Res. 41: W09420.

Rudner, M., Biedermann, R., Schröder, B. and Kleyer, M., in press. Integrated grid based ecological and economic (INGRID) landscape model - a tool to support landscape management decisions. Env. Mod. Softw.

Saunders, S. C., Chen, J., Crow, T. R. and Brosofske, K. D., 1998. Hierarchical relationships between landscape structure and temperature in a managed forest landscape. Landscape Ecol. 13: 381-395.

Schröder, B., Rudner, M., Biedermann, R. and Kleyer, M., 2004. Ökologische sozio-ökonomische Bewertung von Managementsystemen für die Offenhaltung von Landschaften - ein integriertes Landschaftsmodell. UFZ-Bericht 9/2004: 121-132.

Schröder, B., Rudner, M., Biedermann, R., Kögl, H. and Kleyer, M., 2006. Evaluating ecological consequences of anthropogenic mosaic cycles - a landscape model for quantifying the trade-off between conservation needs and economic constraints. submitted.

Schröder, B. and Seppelt, R., 2006. Analysis of pattern-process-interactions based on landscape models - overview, general concepts, methodological issues. Ecol. Model. in press.

Si, B. C. and Zeleke, T. B., 2005. Wavelet coherency analysis to relate saturated

HESSD

3, S963–S967, 2006

Interactive Comment

hydraulic properties to soil physical properties. Water Resour. Res. 41: W11424.

Zinko, U., Seibert, J., Dynesius, M. and Nilsson, C., 2005. Plant species numbers predicted by a topography-based groundwater flow index. Ecosystems 8: 430-441.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 3, 1185, 2006.