

Interactive comment on “Physically-based modeling of topographic effects on spatial evapotranspiration and soil moisture patterns in complex terrain” by M. Liu et al.

Anonymous Referee #1

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General comments

Commonly scientists derive evapotranspiration fluxes with the Penman-Monteith equation, using basic, spatially variable meteorological and topographic data. The authors address the question how the calculated evapotranspiration fluxes are affected by spatial differences in wind, radiation and land use in an area containing both mountains and flood plains in southern Germany. They use globally available input data and an open source scientific model. Scientific relevant questions are addressed, for instance the contribution of individual factors to the overall variability of evapotranspiration, and the

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effect of scale (100 versus 1000 m resolution). The authors provide an extensive and appropriate literature review. In general the methods and model are well described. The results are clearly illustrated in graphs and tables. The language requires improvements at various places though. The main interpretations and conclusions seem sound with respect to the analysis and results. In my view this paper is very useful for the HESS audience.

Specific comments

Page 7060, line 23,24 How accurate can r.sun deliver daily radiation data? How accurate can METRAS PC deliver daily wind velocities?

Page 7061, line 2; Figure 1 Suddenly here the terms ‘inner and outer domain’ are used. Introduce these terms in the legend of Figure 1.

Page 7061, lines 9-11, Figure 2 It seems that the legends for inner and outer domain are mixed up in the figure. Text and figure are contradicting.

Page 7063, line 3 Show the Richards equation, including the root water uptake term.

Page 7065, lines 6-10 What is the source of the hydraulic parameters of the four soils?

Page 7067, lines 18-25 Both the bottom boundary condition and the lateral drainage condition determine in concert the simulated groundwater levels. The current description is not clear. I assume the mentioned linear relation between groundwater level and elevation refers to the initial soil moisture conditions only. How did you calculate lateral drainage, if you assumed a zero flux condition at 3 meter depth? Which drainage resistance and drainage level did you apply? Please clarify!

Page 7069, lines 14-16 I don’t understand this sentence

Page 7069, lines 21-24 ‘In case of highly permeable soil, the soil transportation capacity is much weaker’. This seems an odd statement. Probably you mean that more permeable soils get more dry. At drier soils the hydraulic conductivity and thus vertical

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soil water flux is smaller.

Page 7071, lines 6-11 + lines 26,27 Indeed the assumed drainage condition will have a pronounced effect on the simulated soil water contents. This will also affect the simulated ET fluxes. Therefore, how hard is your conclusion that 'the spatial ET pattern is well related to topography'?

Page 7072, lines 15-17 In such a mountainous terrain, the use of a groundwater model might be problematic. A refinement with respect to the current simulation might be achieved by specifying the local soil depth to the bedrock with fast drainage in high elevations and groundwater level – drainage flux relations at low elevations. You think this might be feasible for your experimental area?

Technical

Page 7057, line 10 For potential ET you use both ETP and PET. Use consequently one abbreviation.

Page 7059, line 21 'originates' should be 'originating'

Page 7059, line 26,27 'the numerical experiments with the SWAP model is performed' should be 'numerical experiments with the SWAP model are performed'

Page 7060, line 10 'contains' should be 'containing'

Page 7062, line 14 'the cell-based LAI values' should be 'that the cell-based LAI values'

Page 7065, line 7 'soil water head' should be 'soil water pressure head'

Page 7067, line 4 'the soil hydraulic information' should be 'soil hydraulic information'

Page 7068, line 23 'and exposed to' should be 'and is exposed to'

Page 7069, line 23 'evporation' should be 'evaporation'

Page 7070, line 14 'Because in general' should be 'In general'

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Page 7070, line 28 'Figuers' should be 'Figures'

Page 7071, line 3 'the on the north side' should be 'on the north side'

Page 7072, lines 2,3 'partition' should be 'partitioning'

Page 7072, line 9 'the resulted spatial variation' should be 'the resulting spatial variation'

Page 7072, line 24,25 'that the wind effect is much stronger than radiation, so the author call' should be 'the wind effect is much stronger than radiation, so the authors call'

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 7055, 2011.

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