

Interactive comment on “Does WEPP meet the specificity of soil erosion in steep mountain regions?” by N. Konz et al.

N. Konz et al.

Received and published: 6 June 2009

First of all we highly acknowledge the fair and very constructive contributions of both reviewers and of the editor. The suggestions helped us to restructure our findings and significantly improve the scientific content of the revised manuscript. In the following we respond to each of the reviewer’s comments; our answers are written in between #. The revised version of the manuscript will be submitted by the end of next week.

Answer Referee1

General Comments

The paper describes use of the Water Erosion Prediction Project (WEPP) model, but does not indicate what version of WEPP was used? The authors need to be sure to

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indicate what model version was used, because WEPP has recently been updated with corrections and enhancements to the winter process components (in model version 2008.907, released in early October, 2008). The last public release of WEPP prior (version 2006.5) has known deficiencies in predictions of winter processes such as frost and thaw development, and snow melt. If the older version of WEPP (v2006.5) was used in this research, a suggestion would be to rerun the model simulations using the newest release (v2008.907) and determine if there was any effect on predicted results for this study.

#We included the version of WEPP, which actually is the newest release 2008.907. In this version winter processes simulation such as frost and thaw development and snow melt have been improved. However, the simulation results do still not correspond with the measurements. This indicates shortcomings of the model in computing relevant alpine erosion processes. Please refer to the revised section ‘Discussion, 3.2 long-term modeling’ of the new manuscript.#

Also, as the authors point out, WEPP was designed to simulate sheet and rill erosion from overland flow, not soil losses due to mass failure and gravity forcing. Addition of those types of erosion process simulation to the model would be needed to allow improvement of its prediction of total soil movement under the conditions described in this paper.

#We fully agree with this comment and want to add that besides the mass failure and gravity forcing, erosion triggering processes as for instance the friction of the snow cover (in case of snow sliding) is an important process that has to be included in order to adjust WEPP to subalpine basins. Further, we can conclude that erosion due to gravity forcing (measured by sediment traps) as it is described in chapter 3.1.1 is exclusively relevant on the landuse type pasture without dwarf shrubs whereas this process was of limited significance on meadows and pasture with dwarf shrubs (see Table 2). The model, however, fails for long term prediction on all three landuse types. Thus, gravity forcing during the vegetation season might not be a driving process of erosive

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mass transfer in alpine conditions.#

Specific comments

1. Page 2155, Line 5, Change "Alewell et al., 2007" to "Alewell et al., 2008". #We corrected this in the revised manuscript#
2. Page 2157, Lines 10-11, the text indicates that slopes ranged from 35-39 degrees on all plots. However, in Table 1, plot pawo2 has a slope angle of 8 degrees shown? Is the table incorrect, or the text? Please correct as appropriate. #That was a typo the correct slope is 38°. We corrected this in the revised manuscript.#
3. Page 2157, Line 25 - change "precipitation soil moisture and surface flow" to "precipitation, soil moisture, and surface flow". #We corrected this in the revised manuscript.#
4. Page 2160, Line 2 - Some better or additional citations for the WEPP model (instead of Flanagan and Livingston, 1995) would be "Flanagan and Nearing, 1995" - NSERL Report #10 - WEPP Technical Documentation, "Flanagan et al., 2001" - Flanagan, D.C., Ascough, J.C. II, Nearing, M.A. and Laflen, J.M. 2001. Chapter 7: The Water Erosion Prediction Project (WEPP) model. In Landscape Erosion and Evolution Modeling, 145-199. R.S. Harmon and W.W. Doe III, eds. New York, N.Y.: Kluwer Academic / Plenum Publishers , and "Flanagan et al., 2007" – Transactions of ASABE 50(5):1603-1612. #Thank you for this suggestion we incorporated the citation.#
5. Page 2161, Lines 10-11 - the text states that the initial water saturation of the soil was set at 25% based upon measurements. However, that value seems extremely low, considering that the soils were presumably under a snow cover. Initial saturation is the percentage of the soil porosity that is filled with water, and ranges from 0-100%. Please check to make sure that the 25% value is accurate. #The value of 25% soil moisture is correct. To our opinion, this value seems not to be unrealistic since snow cover during winter time does not mean automatically that the soil has to be saturated, this is only the case if snow melt does take place. Furthermore the soil texture is coarse

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and consequently, the water retention is low. #

6. Page 2162, Line 9 - change "Tiscarenolopez" to "Tiscareno-Lopez". Change "analyze" to "analysis". #We corrected this in the revised manuscript.#

7. Page 2163, Line 13 - change "can not" to "cannot". Change "trough" to "through". #We corrected this in the revised manuscript.#

8. Page 2163, Line 14 - change "trough" to "through". #We corrected this in the revised manuscript.#

9. Page 2163, Line 15 - change "can not" to "cannot". #We corrected this in the revised manuscript.#

10. Page 2163, Line 17 - change "for weighing" to "by weighing". #We corrected this in the revised manuscript.#

11. Page 2163, Line 20 - change "amplify therefore" to "therefore amplify". #We corrected this in the revised manuscript.#

12. Page 2164, Line 22 - change "measurements conducted" to "measurements, where both observed and predicted". #We corrected this in the revised manuscript.#

13. Page 2164, Line 25 – delete "its". #We corrected this in the revised manuscript.#

14. Page 2164, Line 26 - change "tends" to "tend". #We corrected this in the revised manuscript.#

15. Page 2165, Lines 20-21 - change "analyzes" to "analysis". #We corrected this in the revised manuscript.#

16. Page 2165, Line 27 - change "pot lies" to "plot lies". #We corrected this in the revised manuscript.#

17. Page 2166, Line 10 - change "site were" to "site where". #We corrected this in the

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revised manuscript.#

18. Page 2168, Line 22 - change "was simulated" to "were simulated". #We corrected this in the revised manuscript.#

19. Page 2168, Line 24 – change "those hight" to "these high". #We corrected this in the revised manuscript.#

20. Page 2168, Line 24 - change "implemented to" to "implemented in". #We corrected this in the revised manuscript.#

21. Page 2170, Lines 1-2, reference for Flanagan and Livingston, 1995, is incomplete. Correct citation would be: "Flanagan, D.C. and Livingston, S.J. (editors). Water Erosion Prediction Project (WEPP) Version 95.7 User Summary. NSERL Report No. 11, National Soil Erosion Research Laboratory, USDA-Agricultural Research Service, West Lafayette, Indiana, 141 pp., 1995". #Thank you for this suggestion we corrected the citation in the revised manuscript.#

22. Page 2170, Lines 19-20, change title of article to "WEPP - A new generation of erosion prediction technology". #Thank you for this suggestion we corrected the citation.#

23. Page 2170, Line 31 - change "Deerascough" to "Deer-Ascough". #Thank you for this suggestion we corrected the citation.#

24. Page 2171, Lines 11-12 - reference is incomplete. Citation should be: "Robichaud, P.R. and Brown, R.E. Silt Fences: An Economical Technique for Measuring Hillslope Soil Erosion. RMRS-GTR-94, Rocky Mountain Research Station, USDA-Forest Service, 24 pp., 2002. #Thank you for this suggestion we corrected the citation.#

25. Page 2171, Lines 13-14 - reference is incomplete. Citation should be: "Savabi, M.R., Young R.A., Benoit G.R., Witte J.M. and Flanagan, D.C. Winter hydrology. Chapter 3 in (D.C. Flanagan and M.A. Nearing, eds.): USDA-Water Erosion Prediction Project (WEPP) Hillslope Profile and Watershed Model Documentation. NSERL Re-

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port No. 10, National Soil Erosion Research Laboratory, USDA-Agricultural Research Service, West Lafayette, Indiana. 1995.". #Thank you for this suggestion we corrected the citation.#

26. Page 2171, Line 25 - change "Wepp" to "WEPP". #We corrected this.#

27. Page 2173, Table 1 - change "1 5.3" to "15.3"; slope listed for pawo2 is 8 degrees - is this correct, or should it be 38 degrees? #The 38° in the flow text is correct.#

28. Page 2174, Table 2 caption – need to superscript "-1" in "kg ha⁻¹". #We changed this.#

29. Page 2176, Table A1 - change units for residue mass from "kg m x ⁻²" to "kg m⁻²". #We changed this.#

30. Page 2176, Table A1 - the units listed for the last 5 cover parameters are "0-1", but that is actually the range of values. The units themselves are actually dimensionless fractions, so suggest changing "0-1" to "-". #We changed this.#

31. Page 2177, Table A2 - units listed for "frost free period" should be "days", not "integer". Units listed for "number of grasses along a 100 m transect" should be "#" and not "integer". Units listed for "plant drought tolerance factor" should be "-" or "m/m", not "0-1". #We changed this.#

32. Page 2178, Table A3 - in the units for "CEC", the "-1" needs to be superscript. #We changed this. The missing superscripts got apparently lost during formatting the HESSD document. #

33. Page 2180, in caption for Figure 2 - change "gets out of the trench" to "comes out of the trench". #Thanks, we changed this.#

34. Page 2183, change caption to: "Fig. 5. (a) Measured monthly precipitation, (b) measured (black) and WEPP-simulated (grey) surface flow, and (c) measured (black) and WEPP-simulated (grey) erosion rates, for meadow m3 from April to November

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2007.". #We changed this.#

35. Page 2184, Figure 6 - Initial soil moisture values input to WEPP appear to have been too low from this figure. Please see comment #5 above. #The initial saturation level of 25% is set due to soil moisture measurements. Furthermore, an initialisation of 20 years was run. Figure 6 gives the results of soil moisture of the 21st year of the run and should not be influenced by the given initial saturation level.#

36. Page 2187, Figure 9 caption - change "manually" to "manual". #We changed this.#
#Thank you very much for the detailed language check!#

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 2153, 2009.

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