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Hydrology and Earth System Sciences Discussions

Interactive comment on "Modelling the inorganic nitrogen behaviour in a small Mediterranean forested catchment, Fuirosos (Catalonia)" *by* C. Medici et al.

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Thank you very much for your comments and suggestions.

Answers to the comments are organized according to page number P and line number L:

P5667L2: the eco-systems. Specified in the manuscript.

P5667L21: Changed in the manuscript.

P5668L23: Added in the manuscript.

P5670L17: semi-distributed. Changed in the manuscript.

P5672L24: The conceptualization of the riparian zone we adopted represents basically an area across the stream of 30 meters in width and 2000 meters long that basically corresponds to the alluvial zone that goes along the edge of the river.

P5674L1: The calibration period was the same considered for the INCA-N model calibration (Bernal et al. 2004). Moreover, it was decided to consider 3 years for the calibration period not only for a purpose of comparison, but also because this period presents highly contrasting hydrological conditions that are necessary to capture all the particularities of the hydrological and biological catchment behaviour.

P5674L4: With “temporal validation process” it was meant to highlight that the model was tested using a period of observed data different from the one used for the calibration process. Added in the manuscript.

P5674L6: Global refers to the complete period of calibration or validation. Added in the manuscript.

P5674L15: Done.

P5675L4: Done.

P5675L8: Done.

P5676L10: Done.

P5678L27: Done

P5679L4: Done

P5679L4: Done

P5680L26: Done

P5681L20: Done

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P5682L1: The reverse flux is water flowing from the stream to the riparian zone (Medici et al., 2008).

P5683L24-27: Understanding what the anonymous referee means with this comment, the authors decided to remove the last two sentences completely.

Concerning the general comment and the specific comment P5677L9-16, the authors completely agree with the anonymous referee about the importance of assessing properly the sensitivity and uncertainty of the models taken into account in this work and are perfectly aware that the one-at-a-time sensitivity analysis presented in the manuscript is certainly not the best way to address this issue. The authors are also aware that this kind of analysis in water quality modelling is becoming increasingly appreciated (Dean et al., accepted paper; Rode et al., 2007, Beven 2008). For these reasons, we have already undertaken a general sensitivity analysis (GSA) using Monte Carlo simulations and considering the Kolmogorov-Smirnov statistic (Spear and Hornberger, 1980) to identify the key parameters controlling models behaviour and a generalised uncertainty estimation (following the GLUE methodology) to obtain the 5 and 95% GLUE prediction bounds for each model. Hence, due to the amount of information and results obtained from such work, the authors think there should be enough material for a separate paper (which is being already organized) concerning just the sensitivity and uncertainty analysis and the comparison between the models, as it was done by others authors, as for example McIntyre et al, 2005, Rankinen et al, 2006 or Dunn 1999. Moreover, the inclusion of the sensitivity and uncertainty analysis results obtained as explained before would increase a lot the number of pages of the manuscript under revision and the partial inclusion of this analysis should result in an incomplete, thus not adequate, way to deal with the question.

Further comments and changes added to the manuscript:

1. A new co-author has been added (M. Martín) who gave an important contribution to the last review of the present manuscript. 2. Table 1 has been corrected (there were

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few mistakes in the parameter values shown) 3. Table 3 has been corrected (there were few mistakes in the LU4R-N model efficiency indexes) 4. Fig. 7 has been corrected (we realized there was a mistake in the LU4R-N model validation graph)

References:

Beven KJ: Environmental modelling: un uncertain future? Routledge, London. Dean S, Freer J, Beven K, Wade AJ, Butterfield D: Uncertainty assessment of a process-based integrated catchment model of phosphorus. Stoch Environ Res Risk Assess, DOI 10.1007/s00477-008-0273-z. Dunn S: Imposing constraints on parameter values of a conceptual hydrological model using baseflow response. Hydrol Earth Syst Sci, 3(2), 271-284, 1999. McIntyre R., Adams M., Ford D., and Grierson F.: Rewetting and litter addition influence mineralisation and microbial communities in soils form a semi-arid intermittent stream. Soil Biol Biochem., 41, 92-101, 2009. Medici C., Butturini A., Bernal S., Vázquez E., Sabater F., Vélez J. I. and F. Francés: Modelling the non-linear hydrological behaviour of a small Mediterranean forested catchment. Hydrol. Process., 22, 3814-3828, 2008. McIntyre N, Jackson B, Wade AJ, Butterfield D, Wheater HS: Sensitivity analysis of a catchment-scale nitrogen model. J. Hydrol 315(1-4):71-92, 2005. Rankinen K, Karvonen T, Butterfield D: An application of the GLUE methodology for estimating the parameters of the INCA-N model. Sci. Total Environ 365(1-3):123-139, 2006. Rode M, Suhr U, Wriedt G: Multi-objective calibration of a river water quality model-information conten of calibration data. Ecol Model 204(1-2):129-142. Spear RC, Hornberger GM: Eutrophication in Peel Inlet II: identification of crucial uncertainties via generalised sensitivity analysis. Water Res 14:43-49,1980.

Please also note the Supplement to this comment.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 5665, 2009.