Biogeosciences Discuss., 12, C5137–C5139, 2015
www.biogeosciences-discuss.net/12/C5137/2015/

Biogeosciences
Discussions
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Interactive comment on "Model aided quantification of dissolved carbon and nitrogen release after windthrow disturbance in an Austrian karst system" *by* A. Hartmann et al.

Anonymous Referee #1

Received and published: 10 September 2015

GENERAL COMMENTS

In this paper, a new type of semi-distributed model is applied to compare the solute transport (DIN and DOC) before and during a wind disturbing period at the study site LTER Zöbelboden (Austria) located in the northern part of the national park "Kalkalpen". Virtual tracer experiments were used to create transit time distributions that expressed how the impact of the storms propagated through the variable dynamic flow paths of the karst system.

The title clearly reflects the contents of the paper and the abstract provide a concise and complete summary. In chapter one a good and informative introduction regard-

ing the topic of the paper is given. The chapter two describes shortly the study site, the available data sets and the recent disturbances. Information about the size of the study site and also how the DOC and DIN were analysed is missing. The figures 1 and 2 supplement the descriptions very well. The used methods are explained very clear in chapter 3 and describe the model hydrodynamics, as well as model calibration and evaluation. The results described in chapter 4 are explained very well. The authors pronounce that the simulated discharge follows adequately the variations of the observations. They have rightly identified that some small events are not reproduced by the model and the simulations of the weir's discharge tend to under-estimate peak flows. I guess this is an important fact for the further results on the loss of DIN and DOC since especially during the peak flows someone would expect a very high export of the investigated solutes. Therefore, it could be expected that the impact of the disturbance on the ecological system in particular on the loss of DIN could be higher as mentioned. Maybe further experimental studies can improve the model performance especially during peak flows. Otherwise, very often water samples for analysing DIN and DOC are missing especially during such peak flows which are essential requirements for validation of simulated solute concentrations. In the discussion chapter the authors connect their results to other studies in a critical way and give proper credit to related work and clearly indicate their own contribution The explanations about the reliability of calibrated parameters and model simulations, about the impact of storms on the solutes and about the transport of nitrate through the hydrological system including leaching from soil are written very clear and in a comprehensible manner. In addition to the given explanations I would like to note that it is very important to emphasize that the transport processes of nitrogen and organic carbon through the hydrological system are different. The authors rightly mentioned several reasons for the different behaviour of DIN and DOC due to the disturbance impacts. The conclusions summarize the important results of this study and emphasize the very important fact that water quality models that have been calibrated without consideration of such external impacts will provide poor predictions. Especially the mentioned memory effect of hydrological

systems on past impacts is very important for model applications.

SPECIFIC COMMENTS

Page 11991, chapter 2: Maybe, please add some short information about the size of the study site and if possible what laboratory methods are used to analyse DOC and DIN.

TECHNICAL COMMENTS

Page 11991, line 10: Please use limestone instead of lime-stone

Page 11991, line 20: Please correct the capitalization: stream sects. instead of stream Sects.

Page 11999, line 17: Please erase the comma after the word The

Page 12000, line 10: Please erase the double word “in in”

FINAL OPINION

In my opinion this paper can be published in respect to the explained comments. It is fluently written, well-structured and contains a very good model application based on a large experimental dataset which enables the authors to estimate the impacts of windthrow disturbance on the dissolved carbon and nitrogen release. The paper addresses relevant scientific questions within the scope of journal and present a novel model approach.

Interactive comment on Biogeosciences Discuss., 12, 11987, 2015.