Hydrol. Earth Syst. Sci. Discuss., 4, S2169–S2172, 2008
www.hydrol-earth-syst-sci-discuss.net/4/S2169/2008/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Assessment of hydrological and seasonal controls over the nitrate flushing from a forested watershed using a data mining technique" *by* S. Rusjan and M. Mikoš

S. Rusjan and M. Mikoš

Received and published: 8 February 2008

- As regards the general knowledge of the nitrate flushing, it is rather well established that the soil wetness and temperature conditions are one of the main driving factors that affect the nitrogen cycle, as mentioned in the reviewer comment, if we do not take into consideration other possible factors (pedology, atmospheric inputs, forest history, etc.) However, when we move towards a time step of a rainfall event, the actual response of the nitrate flushing to particular hydrological conditions which happened in a particular seasonal biogeochemical framework is not so clear and many rather contrasting explanations of the observed runoff-induced nitrate pulses can be found in the listed references. In our study, we tried to describe the highly variable observed streamwa-

ter nitrate pulses combining the information about longer preceding hydrological and seasonal biogeochemical conditions with information about a particular hydrological event.

- Other more mechanistic approaches (process-based and conceptual models) available for the modeling of the nitrate exports from the watersheds are included, presented and discussed in the Introduction and Discussion section; 5 references were added. In the Conclusion section the possibility of combining the two approaches was addressed.
Further comments: Temporally, the calculations in the mentioned models are usually performed at daily or even longer time steps; therefore, their application for the modelling of hydrologically, event-induced nitrate mobilization is limited.

- p 4219: The explanation of the choice of the pre-defined set of variables was extended; 3 references related to the findings of previous studies were added.
Text added: High temporal resolution of the detailed biogeochemical settings which control the soil nitrogen transformations is almost impossible to obtain, however, we believe that the specific, spatially uniform hydrogeological and pedological settings at the Padez watershed enabled us to link the observed streamwater nitrate concentrations to the main driving factors of the nitrate formation considered by the given attribute selection.
Further comments: We have considered and implemented the effect of the watershed wetness, temperature and hydrological conditions through the selected attributes used for the description of the observed event-induced nitrate fluxes. Other input and output variables would be undoubtedly equally plausible.
Text added (section 4.2): For further interpretation additional vegetation characteristics and detailed description of seasonal changes in soil characteristics would have to be considered. However, as in our case, such information is usually not available, also in the mechanistic approaches these characteristics are addressed differently. This is also beyond the mainly hydrological framework of the study.

- We have excluded possible anthropogenic disturbances. The discussion was ex-

HESSD
4, S2169–S2172, 2008

tended under the Study area description. The disperse areas of the complex cultivation patterns which are in the state of successive afforestation occur on the top of the hills and are separated from the stream network by wide areas of forest. There are few small settlements on the top of the hills but no settlements can be found in the valleys and along the streams.

- Regarding the possible effect of wet deposition:
Text added (Results and Discussion section, p 4218): Measurements of the nitrate concentration in bulk rainfall samples during different episodes showed small concentrations of nitrate in rainfall (i.e. below 0.2 mg/l-N). Thus the wet deposition was not considered as an important source of stream water nitrate during hydrological events.
Text added (p 4219): Possible additional source of the nitrate to the stream during the observed rainfall events could be related to the presence of black alder in the riparian areas which is known because of the symbiotic relationship with a nitrogen-fixing bacterium *Frankia alni*.

OTHER CORRECTIONS:

- p 4215, lines 27-29: The data about the soil hydraulic conductivity was added; in the orig. manuscript only the hydraulic conductivity of the rock strata (flysch) was presented.
- p 4217, lines 8-9 and page 4219 line 18: More details about the experimental setting and the calculation of EW were provided.
- p 4220, line 1-10: New text as an explanation was added.
Text added: Continuous measurements of the nitrate concentration during the early spring hydrographs and other dry periods disclosed a diurnal cycle of nitrate concentration oscillations with the appearance of maximum concentrations early in the morning and minimum concentrations late in the afternoon. The diurnal oscillations in the nitrate concentration are seasonally dependant and could be associated to the diurnal activity of aquatic photoautotrophs and surrounding, especially riparian forest vegetation similarly as described by Burns (1998). However, the diurnal oscillations of the

HESSD
4, S2169–S2172, 2008

nitrate streamwater concentrations is not considered in detail in the paper as the main stress is on the nitrate streamwater concentration pulses during the rainfall events.
- Table 2 was changed; the schematic representation of the regression tree model was added and is shown in new Fig. 5.
- Fig. 1: Soil use map could be used instead of elevation map but the readability of the figure would be reduced.
- Fig. 2 was improved. Fig. 2(A)(real time scale + vertical lines) represents the recorded rainfall events on the continuous timescale; Fig. 2(B)(instance Nos. + vertical lines) gives a detailed presentation of streamwater nitrate concentrations during the observed events.
- The visibility of figures Nos. 2, 6 (original Fig. 5), 8 (original Fig. 7) was improved with vertical lines which separate the periods of the observed rainfall events.
- Fig. 8 (old Fig. 7). Explanation of unrealistic prediction of N concentration during the last hydrograph was added to the text when discussing the figure and the problem of overfitting the model to the particular dataset (section 4.2).

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 4211, 2007.