

Interactive comment on “Dynamic analysis of groundwater discharge and partial-area contribution to Pukemanga Stream, New Zealand” by V. J. Bidwell et al.

Anonymous Referee #1

Received and published: 12 September 2007

Summary

This article addresses the problem of hydrograph separation. The baseflow contribution to streamflow in the Pukemanga Stream (catchment size 3 ha) is studied, in view of potential nitrate contamination problems. The article does not present a clear conceptual model of the catchment. The numerical model is a lumped, partially physically based model with a number of calibration parameters. Uniqueness and robustness of the calibration is not sufficiently demonstrated. The physical meaning of various model parameters is not discussed in detail. Various modeling concepts from the literature

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

are combined and the article does not present novel conceptual ideas. The focus is on the application to a real catchment. However, the study lacks a clear practical focus. A model is always built to answer a concrete question and not to simulate reality in some abstract sense. What is the intended use of this model? The article should include a demonstration of the intended application.

Main Comments

- The introduction starts out with a section on the importance of landcover for nitrate export. The link to the abstract and to the main focus of the article is not clear.
- In the coupled US-zone / groundwater model, there are at least 4 fitting parameters (possibly more): α , D_T , T_v and A_{gw} . The authors briefly mention calibration on page 2469, but no info quality of fit, parameter correlations (which I expect to be significant, e.g. D_T and A_{gw}) etc. is given. Moreover, it is conceptually unclear, why these parameters should be time-variable (particularly A_{gw}).
- The hydrometric model should be able to simultaneously explain streamflow and groundwater level data. It appears that the authors used groundwater data and streamflow data separately to calibrate various parameters. Why not fit all parameters simultaneously, using the entire dataset?
- Conceptually, it is hard to understand what a reduction of A_{gw} means: Does it mean that the groundwater recharged on the remainder of the catchment flows to another stream? Or does it infiltrate into deeper aquifer units? Or does it just discharge a little further down into the Kiripaka Stream? (In that case it would not make a big difference for nitrate loads). No physical explanation is given for this concept, although this appears to be a key point in the article. Overestimation of streamflow could probably also be corrected with reduced infiltration capacity and consequently higher actual ET. I suspect that the choice and parameterization of $F(a,w)$ has a significant effect on the simulated water balance, but this is not at all discussed in the article.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

- The concept of different contributing areas should be re-examined. The discussion given on page 2475 does not sufficiently clarify the issue.

Details

2462-14-16: It is stated that 58-83 % of streamflow is baseflow. At the same time 78-93% of the flow generation on a unit area basis is baseflow. Contradiction? Please rephrase.

2463-3: Where is the Waikato region? Is it similar to the region studied here?

2463-78: Load usually indicates a quantity in mass per time. Mass per volume is a concentration.

2464-7-10: Rephrase. The first principle is hard to understand.

Figures: Observed discharge is compared to predicted groundwater discharge in figs 3-5. The model also produces overland flow / interflow. Why then not compare simulated and observed total discharge?

Fig 1: How was the catchment of the Pukemanga stream delineated?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 2461, 2007.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper