Hydrology and Earth System Sciences Discussions

Interactive Comment

Interactive comment on "A conceptual model of flow to the Waikoropupu Springs, NW Nelson, New Zealand, based on hydrometricand tracer (^{18}O, Cl,^{3}H and CFC) evidence" by M. K. Stewart and J. T. Thomas

Anonymous Referee #1

Received and published: 6 July 2007

1) The paper includes isotope hydrology study in the karst aquifer in the New Zealand and fully addresses the scope of the HESS. 2) In reviewer opinion the authors in novel way applied different environmental isotopes to study origin of recharge, water resources, and water dynamic in heterogeneous karst. The isotope and hydrological data are put into common conceptual and mathematical model and the results obtained enable the better understanding the hydrological system being under investigation. 3) The conclusions are clearly formulated and result directly from the measurements, modeling and geological and hydrological data. 4) The scientific methods applied and the

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assumptions are valid and clearly outlined. 5) The results of modeling multi-isotope measurements combined with hydrological data and geological knowledge are sufficient to support the findings summarized in conclusions. 6) The experiments and the modeling technique are clearly described and sufficiently completed to be applied by fellow scientists. 7) The authors give the proper credit to the related work and clearly indicate their own origin contribution. 8) The title clearly reflects the content of the manuscript. 9) The abstract provides a concise and complete summary. 10) The overall presentation is clear and well structured. 11) The language is fluent. 12) The mathematical description is correct. However, the reviewer would recommend changing the term "response function" to more representatives "transit time distribution function". By Eq. (4) the reviewer recommends using the term "dispersion parameter DP" instead of D/vx. Additionally do not split DP (or D/vx) into: D- Dispersion coefficient; v- flow velocity and x - flow distance. Those three terms are from artificial tracer transport theory and are not applicable in "lumped parameter approach". DP is defined only as a mass of the variance of the dispersive distribution of the transit time. It includes not only variance in the aquifer (resulting from dispersive-convective transport: D, v, x) but also space variance resulting from the recharge distribution of the catchment surface and/or diffusive exchange of tracer with stagnant water (see e.g.: Maloszewski et al. 2004). Don't use the term "mixing model" for the lumped parameter models (e.g. EPM, DM or DDM) because there is not mixing in the aquifer assume be introducing those models (page 1234). 13) The reviewer has the filling that some parts including results of the modeling are described to long. It should be better and more visible after putting all finding (EPM, DM, DDM) for all isotopes into one table. 14) The references are OK.

The manuscript should be published in the present with some small technical corrections mentioned in point (12) and eventually some small shortages mentioned in (13).

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