

Interactive comment on “Using stable isotope tracers to identify hydrological flow paths, residence times and landscape controls in a mesoscale catchment” by P. Rodgers et al.

P. Rodgers et al.

Received and published: 8 June 2005

The helpful comments from referee 2 on this paper are gratefully acknowledged and were also very constructive in guiding the revisions and re-analysis undertaken. It was particularly useful that the referee was able to provide a critique that addressed the broader issues of the paper and thus complimented the more specific methodological comments provided by the first reviewer.

General comments:

1. General comments on the relationship between residence time and catchment size: this proved very useful for guiding the addition of further literature review and contextual discussion in both the introduction and conclusions and implications sections of the paper.

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2. Methodological issues: in accordance with referee 1's comments, considerable additional justification has been added on the methodological approach adopted. It is welcoming, however, that referee 2 recognizes the limitations imposed on this study by its larger scale and acknowledges the utility of the sine wave fitting to the exponential model as a means of catchment comparison. It is important to reiterate the primary investigative aim of the study was to provide insights into the hydrological functioning of the Feugh catchment and account for the differences in isotope response. In order to address the specific methodological gap the reviewer identifies by comparing the simplistic methods used here with those of more complex transport models, considerable further instrumentation and resources would have been required. In other words, to attempt to fully assess the impact of increasing scale and sparsely-instrumented catchments, a better instrumented catchment (in relation to flow measurements and precipitation variability) is nonetheless needed in order to provide the kind of data required by more complex modeling methodologies. This was therefore outwith the scope of a monitoring program that was always designed as being fairly minimalist and tracer-based.

Specific comments:

1. p3, row2-3: Objection to the use of the terms 'catchment waters' and 'hydrological source areas' appears to be one of preference rather than any particular scientific reasoning. Therefore, it was viewed that it was advantageous to retain this terminology on the grounds of consistency with past publications by the authors involved.
2. p3, row12 & p4 row 18: Text was changed
3. Changed 'catchment landscape controls' in text to 'landscape influences and/or catchment characteristics'.
4. Chapter 3: Short explanation of hydrograph separation method added.
5. p8 row 18: Text was changed.

6. Chapter 4: Changed to 'Results and Discussion' and general section structure simplified.

7. Awkward terminology: reference to 'input and outputs' removed; 'hydrological controls' changed to 'stream water d18O response to flow'; 18O patterns removed but retained where reference is to seasonal patterns in the data itself; 'Preliminary' removed in reference to residence times.

8. Tables: catchments ordered by sub-catchment primarily to emphasise downstream changes where applicable, then by size. This generally mirrors how the results are discussed in the text. Thus it was felt that any other ordering conventions would be more confusing.

Interactive comment on Hydrology and Earth System Sciences Discussions, 2, 1, 2005.

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