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General Comments

1. This paper presents a Ca budget for an oak-hornbeam ecosystem; it adds a data point to the growing number of sites for which elemental fluxes have been described at the ecosystem scale. This type of information is essential to future generalizations about nutrient cycling at a larger scale. The authors also provide detail about a number of processes internal to the ecosystem (solution concentrations and flux rates); these observations, too, are valuable for eventual comparison to other ecosystems. I believe that the paper should be published, more for its contribution of data than for the insights it might provide. The authors do little to tell us what's new or surprising about their contribution.

2. The model was not presented in enough detail to contribute much to the paper. It should either be removed or else more of the methods and results should be presented. The only results of the model that are currently included in the paper, namely that Ca export is large and probably supported by weathering of Ca nodules, and that depletion of Ca may be occurring at a slow rate, could be shown more simply without the model. If the model contributed to the authors' understanding of these processes, they didn't show us how. If the model stays in the paper, it needs to be more clearly presented, probably in a methods section (it is now described in the discussion).

3. It is difficult to assess the model results without a better description of the model. I am worried, however, that the results of the model are really assumptions made in the process of parameterizing the model. The authors conclude that Ca depletion is occurring at a slow rate. They chose the value of weathering inputs of Ca (100kg/ha/yr) to be close to the rate of Ca denudation. If this is true, then the slow loss rate is a foregone conclusion. If they had assumed a higher rate of Ca weathering from this Ca-rich stratum, they could conclude that the forest would be able to sustain high rates of Ca export in streamwater and forest harvest. The reasoning behind the selection of parameter values was not made clear. I fear that the reasoning was circular.

3. The data in Figs 2 and 3 are improperly analyzed and presented. The figure shows multiple years of data plotted with an x-axis running from March to March. A curve fit through these data should be constrained to agree with itself at the start and close of a year. The authors seem not to have understood that the right and left edges of this graph are contiguous; in addition to the error in selecting a form for the curve, they refer to "two maxima" at the beginning and end of the year; the pattern is more or less sinusoidal and there is only one cycle per year. The use of running averages is also misleading. The points exhibit a pattern of autocorrelation that was not in the original data and should not have been (since the points are taken over a period of years) but that was introduced by the averaging technique. These faults call into question the analytical and statistical competence of the authors; I am not capable of providing a rigorous review of their quantitative methods, but I suggest that such a review be obtained.

4. More of the results could be presented in table form. I found it difficult to remember which measurements were made for what duration; I certainly wouldn't remember which measurements were made in which years! Such a table would provide an overview of the intensity of measurements as well as of the values obtained.

5. Consistency of terminology. Pluviolessivate, throughfall, rain water, rainwater, precipitation. Soil, top soil, litter, litterfall, leaf fall. Select one set of terms and use them exclusively.

6. The paper needs considerable editing for clarity and style. I first thought "This paper is not ready for review; it needs to be edited for language first." But I found that I was able to understand the meaning of the authors through all but the most difficult of language problems. I have commented on the language as well as on the science in the paper, but my language review is by no means complete. The paper should be reviewed again for language before it is published.

#### Specific Comments

I have made many notes on the manuscript, not all of which are described here. I did not mark every part of the manuscript that needs editing.

noted by page, line

1 I like abstracts to start with a statement of the problem to be solved. What was the motivation for the study? Why is this information valuable to us?

1,4 American readers would benefit more from a description of the soil than of the geologic age of the shale; does the European audience know what Famennian shales are like? Again, I got this information in the first sentence without knowing why it was important. The calcarious nodules that make the geologic substrate important to the Ca budget are not mentioned in the abstract.

1,9 Having read the paper, I now suspect that "average" means relative to other ecosystems. This is neither clear in the abstract nor substantiated in the paper.

1,11 The nature of the model needs to be explained if anything is to be said about it in the abstract.

1,20 I suspect you mean concentration, not change in concentration (the time derivative?)

3,1-2 "...was shown to be related to ion exchange processes." It sounds like you are refusing to give the information! What ion exchange process, and how does it act? Maybe you meant "was shown to be ion exchange" but if so, tell us what ions and how.

4,13-14 "acid deposition has been accumulating" I don't know whether you mean that "acid has been accumulating" or that deposition rates have been increasing. Maybe you mean that deposition has been significant and therefore acid has been accumulating.

4,19 Quantifying acid in terms of  $\text{CaCO}_3$  requires an intervening step, which should be acknowledged.

4,20ff. The two approaches: surely input-output budgets are a subset of nutrient cycling budgets? You then associate the second approach with your model. As an introduction to your paper, it would be more relevant to distinguish between budgets and models.

6,1-18 This explanation of the approach and goals of the research belongs in the introduction, not the methods section.