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Biogeosciences Discussions

Interactive comment on "Stable isotopes as ecological tracers: an efficient method for assessing the contribution of multiple sources to mixtures" *by* M. N. Bugalho et al.

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We appreciate the referee comments to our manuscript which we address below.

The approach presented in the manuscript is indeed built on our previous work (Barcia et al. 2007). In the present manuscript, however, we show that our approach, previously applied in a narrow and rather specific problem (herbivore diet estimation using N-alkanes) can be extended to a broader audience and different range of problems dealing with stable isotopes and ecological processes (e.g. plant use of water sources). Also, we add a simple-to-use software that implements the model.

In relation to the other comments:

1 - We acknowledge the comments for ameliorating the Introduction. We agree that Dawson (2002) reference is indeed not suitable quoted in the sentence “This property makes stable isotopes useful as natural integrators and tracers of ecological processes…” and it will be omitted. Only West (2006) will be quoted at the end of sentence.

We will reduce the list of references quoting works where stable isotopes were used in order to simplify and better focused the Introduction.

An explanation of Lubtekin and Simenstad (2004) model is described in Page 2428, lines 17 to 28. We also state what we believe is novel in our model: contrary to previous models our approach addresses multiple samples simultaneously, and the condensed list of solutions produced, is enough to answer questions such as: which sources are absent from all samples, or which sources are certainly present in all samples. We believe this is an improvement in relation to previous models and deserves to be brought to the ecology community so that subsequent issues on the subject may be raised. We will, nevertheless, made more explicit such issues in the Introduction.

2 – We tried to use the original d15N data which is presented in Benstead et al. 2006. Although, after correcting for d15N fractionation, we found that all consumers were excluded from the convex polygon, thus turning every sample a nonsensical mixture. Benstead et al. (2006) justify not using d15N in their paper because “…relative uniformity in the mean d15N values of the five organic matter sources at each site limited the utility of these data”. Therefore we felt that there were problems with d15N data and that would be preferable not to use these data.

We must also add that we contacted different research groups looking for more complex data bases (three and more isotopes and multiple sources) to illustrate the efficiency of our model in dealing with a large number of markers but end finding that the most ready to use was the data analysed by Benstead et al. for d13C and d34S.

3 – Our approach allowed novel conclusion to be built around those of Benstead

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et al. (2006) analyzing the same data. For instance, the model was able to explain the full diet of some of the consumers. With the presented approach we were also able to identify which Organic Matter group components (e.g. X. granatum and L. littoraea within mangrove species) were contributing to the diet of some consumers. We also identified which species (e.g. B. racemosa) were certainly included in the diet of consumers.

4 – We will develop in the Discussion the idea referred briefly in the results related to the possible correlations among food sources contributions.

At the time of submission we were not aware of the Moore et al. (2008) paper on using a Bayesian approach in stable isotope mixing models. We are already studying this paper and a reference to this methodology will be certainly included in the discussion of our manuscript.

5 – This will be corrected.

We will also take into consideration the specific comments made by the referee.

Interactive comment on Biogeosciences Discuss., 5, 2425, 2008.