Summary of changes and response to the referee report by Richard Telford for manuscript cp-2013-140 "Similarity estimators for irregular and age uncertain time series"

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Summary of changes

We thank Richard Telford for his constructive review and positive evaluation. In response to his advice we have shortened the synthetic stalagmite simulation section and changed the wording in several places to make the text more accessible. We have also added arrows in Fig. 6 to indicate the positive effect of time series irregularity on the estimation error for the event synchronization function. A detailed response to the comments follows below.

Response to the referee

(Original report cited in italics)

The paper is well written, but overlong and heavy going with all the mathematical notation. It reads as if it is written for an audience of mathematicians rather than palaeoclimatologists. For example, few palaeoclimatologists will need a definition for an irregular time series, but several will need tuple defining.
In the revised manuscript the word "tuple" has been replaced by the (here) equally adequate term "vector". Nevertheless we find it justified to retain some definitions for the sake of completeness and the benefit of readers not in, or new to, the field of paleoclimatology.

The authors make their methods available in a toolbox for MATLAB/OCTAVE. This will present an impediment to those users not familiar with MATLAB. Depending on how computer intensive the process is, would it be possible to develop a web interface akin to OxCal where users could upload their data for processing? An R port would also be very welcome by the part of the community that uses R.
As mentioned in the general comments, it is difficult to assess a correlation estimate without confidence intervals or a significance test. We have relied on COPRA Monte Carlo simulations for the age uncertain ensembles and generate ensembles of AR(1) surrogates to test individual correlation estimates. Both are computationally expensive, even more so when the time series are long and a high power of the test is desired. Therefore it is not (yet) feasible to implement the procedure as an online tool, but we strive to provide a toolbox for R in the very near future.

The text at ∼line 185 that the observation time in an irregular time series may carry some information may be true in some archives, but it is of little relevance to this paper. Figure 2 and the associated text should be well known. Is it necessary here?
We followed the reviewer's advice and removed the statement about the observation time usefulness.

Line 485: do you have to describe making an age-depth model from first principles?
In the revised manuscript we have shortened the description of the simulation procedure and the age model derivation.

Line 626: an uncertainty of 0.1-0.5% is very optimistic for many archives, 1% would be good in many.
We have changed the statement to make it more explicit that these values refer to stalagmites and may be considerably higher for other archives.

Line 648: if you need to summarise the simulation procedure, at least use plain English. Better still, make the text simpler to read and delete this summary
We have removed the summary and shortened the introduction of the step-wise simulation procedure.

Fig 6: Is there a more intuitive way to show the irregular part folding the bar backwards? e.g. arrows
In agreement with the reviewer's advice we have added arrows to illustrate the improvement due to irregular sampling.

Line 930: Is it not obvious that there is uncertainty whatever age-model is used?
The explicit statement is, we believe, justified as the uncertainty is often ignored.

Line 939: Please define a.u. (I presume it is not astronomical unit)
We apologize for the omission and have replaced a.u. (here standing for arbitrary unit) by "time units".