**Climate
of the Past
Discussions**

Interactive comment on "A modelling approach to assessing the timescale uncertainties in proxy series with chronological errors" *by* D. V. Divine et al.

Anonymous Referee #2

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This is a very strange paper. Its aims are entirely worthy: to create a statistical model which estimates chronological uncertainties in age-depth cores. Upon reading the paper, I was expecting an all-encompassing approach with detailed discussion on the previous literature in this area, issues of outliers and robustness, and finally software to enable users to implement their model. I found none of these. Unfortunately the authors seem to have missed a large chunk of the statistical literature in this area, most notably the software packages Bchron, Bpeat, Bacon (all implemented in R) and Oxcal, following the work of Blaauw and Christen (2005, JRSSC), Ramsey (2008, QSR), Blaauw and Christen (2011, Bayesian Analysis), Haslett and Parnell (2008, JRSSC) and Parnell et al (2011, QSR). Two of these actually are referenced in the pa-

per, but this without any further discussion of their relevance here, despite all of these papers attaining numerous citations in the palaeo-proxy age-depth modelling literature.

The knock-on effect of these missing references is that the authors appear to have sadly reinvented already-published material. The idea of using a gamma process to model accumulation is found in both Bacon and Bchron, whereas the strategy of interpolating via the Dirichlet was already discussed in detail in Haslett and Parnell. It is thus hard to ascertain whether anything in this paper is actually novel. In fact, it appears that Blaauw and Christen (2011) and Haslett and Parnell (2008) seem to have gone considerably beyond the models proposed here, incorporating the predictions of hiatuses and outlying dates; common among ^{14}C-dated cores. Neither of these important issues are discussed here.

A final additional oddity is the arrangement of the paper. The methods section contains an introduction to the proposed accumulation process model, followed by four very uninteresting case studies, 3 of which appear to provide no extra insight from the first. The authors seem to realise they provide no extra insight as the captions for the figures are 'Same as in Fig X but for the Y core'. After the 4 case studies, we are then presented with some more methodology, which possibly provides the most (statistically) interesting part of the analysis: the estimation of λ. This is followed by the summary, so that the interesting part of the paper isn't tested on any of the (uninteresting) data sets. This makes for a very unsatisfactory conclusion.

It is my view that this paper would require a fundamental re-evaluation before publication and should not be accepted.

Some more minor (and technical) comments:

- There seems to be no software associated with this paper. This is disappointing, as many palaeoclimatologists will not have the technical expertise required to run the authors' models.

- Some sentences do not make sense, e.g. P32 L21–24, 'It conditions the use...'; P33 L3–7, 'For an accurate assessment...'

- P33 L2 and 4 – 'a' realistic analysis; 'a' probabilistic framework

- P35 L14, 'Every of k' seems wrong

- P36 L1, The algebraic expression here is confusing. Is there supposed to be a product or some other operation performed on the set on the RHS?

- P40 L18, 'to apply'

- P41 L24 'as well as'

- P45, Fig 2(b). I'm not entirely clear what the red asterisks represent. Could the explanation be made clearer?