Clim. Past Discuss., 8, C38–C39, 2012
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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.

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Received and published: 9 February 2012

Divine et al introduce an age-depth modelling procedure that aims to estimate the chronological uncertainty between the dated horizons, modelling the sediment accumulation as a Gamma process. The proposed method seems reasonable, except for the constraint that the accumulation rate should not experience substantial shifts between dated horizons, a deficiency that the final part of the paper works to rectify.

The main weakness of this paper is that is does discuss previous similar work. The method developed is, for example, similar to the P-sequence model in OXCAL which uses a Poisson process to model sediment accumulation. The paper uses OXCAL in one example (without giving sufficient information to allow replication), and the results

appear similar to those of the Gamma process model. This paper would be much more useful it compared the new model with OXCAL and other similar age-depth modelling procedures. This could be done either on theoretical grounds or by using the methodology developed by Telford et al (2004, QSR) and Blockley et al (2007, QSR) to test how well each model preforms with a set of dates that have known properties.

The paper describes a two-step procedure, first to generate K fixed points, and then to model the accumulation between this set of K points N times. The values for K and N are not given and the advantage of using N>1 is not explained.

This paper includes four examples which seem rather similar. In particular, all four have precisely dated horizons, which are rare in practice, rather than the more usual case of having radiocarbon dates with their inherent, often substantial, uncertainty. The text describes how the method works with uncertainty in the dates, so it unclear why this is not demonstrated in at least one example. None of the examples demonstrate the developments in the final section of the paper, which is unfortunate as it would help clarify this section.

The paper does not describe a process for dealing with outliers in the dates. This is a serious omission for any age-depth modelling procedure as outliers are common in radiocarbon dated cores. Techniques for identifying and treating outliers have been developed for existing age-depth modelling procedures, for example OXCAL.

This paper has the potential to be a useful contribution to the literature, but needs substantial work to realise this potential.

Interactive comment on Clim. Past Discuss., 8, 31, 2012.