

# ***Interactive comment on “Reconstructions of biomass burning from sediment charcoal records to improve data-model comparisons” by J. R. Marlon et al.***

**J. R. Marlon et al.**

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Reviewer 1 raises three good questions that we address here after paraphrasing each issue.

1. How is temporal uncertainty accounted for in the dating of charcoal and in the final gridded product?

Temporal uncertainty in the final gridded product is not formally incorporated into the reconstructions. The number of radiocarbon dates or other chronological constraints in a record does provide some indication of the magnitude of age uncertainty, and this

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information is available in the GCD. Formally assessing every age-depth model for the records in the GCD is a non-trivial task, however, and should ideally be undertaken with the researchers who produced the record. Smoothing and gridding the data does account for age uncertainty in the records informally however as it only reveals trends and shifts in biomass burning that are robust across multiple records.

2. How does the conversion to z-scores and the lack of weighting among the merged records in a grid cell affect the representativeness of different records and how does it shape the uncertainties of the reconstructions?

The myriad factors that affect charcoal production, transportation, and deposition in sediments means that there is no universal relationship between charcoal quantities and area burned that can be applied to all records. The conversion of all units to z-scores therefore allows the detection of trends in biomass burning over time but removes any information that may exist about the specific magnitude of area burned recorded by different records in the same grid cell. Also, the size of the grid cells can be controlled in the paleofire R package when grids are produced, but no weighting scheme is applied to the different records that are composited within a given cell. Thus, records are merged that may reflect burning at different spatial scales. This is a recognized weakness of the general approach, but the benefit of standardizing the records comes from our ability to detect and map large changes in charcoal influx at multiple sites over time that would otherwise be impossible.

3. How can it be that a recent time period has less data than an older time period?

Records do not always include sediment from the most modern time period even when older sections of a core can provide robust data. Sections can be lost or destroyed during collection in the field or during extraction, or disturbances at the site can make sections (including the top) of the sediment core unusable. In some cases hiatuses occur, such as when a site dries out for a period of time. Most lake sediments provide continuous records, but soil and bog profiles often have hiatuses, and occasionally this

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happens in lake and marine sediments as well. Another reason that a site may have less data closer to present than in the distant past is when sedimentation rates decline towards the more modern period. In this case, a section of the core the represents the most recent past may only have one or two samples, whereas sections of the same size further down core may contain many samples.

Response to minor comments:

P3L20: Agree to replace “vital” with a word that has more neutral connotations. P3L21: Agree to replace with “affecting” P4I5-6: Agree to replace with Mouillot et al. 2014 P19I7-8: Agree to add more refs to make list comprehensive.

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Interactive comment on Biogeosciences Discuss., 12, 18571, 2015.

**BGD**

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