

Interactive comment on “Identification of reworking in Eocene to Miocene pollen records from offshore Antarctica: a new approach using red fluorescence” by Stephanie L. Strother et al.

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The problem of separating reworked and in situ terrestrial palynomorphs in sediments from the Antarctic margin has hindered many palaeoenvironmental analyses of the continent. As the authors point out – while older, for example, Permian material is easily identified in younger sediments, the same is not true when the reworking is entirely confined to younger sediments. This paper offers the prospect of the development of an important tool that can separate out the reworked material.

Samples from this study were collected from three time slices in a single IODP hole from 300 km of Wilkes Land, Antarctica. The time slices are well chosen, representing important periods in evolution of the cryosphere and are the focus of many studies.

If the technique can be proven to work in these time intervals it will be a great step forward.

After applying standard laboratory processing techniques, thirty specimens from each sample were analysed. I am not a statistician – but this number seems low. Can the authors demonstrate that this level of counting is statistically relevant?

Five species of terrestrial palynomorphs were focused on. Were these the only ones analysed? It's not clear from the text, but it does sound like other taxa were occasionally used. Also, there has been a major revision of the genus *Nothofagus*, while not universally accepted, it may make a difference to the species names used if they decide to use it.

One of the concerns I have involves the determination of in situ material prior to the fluorescence analysis and its implications. As I understand the method, it is assumed that all of the specimens examined are in situ. Reworked material was identified and rejected based on a visual examination of each specimen. Of course, this is the only approach that can be used – but I think that the text should spell out clearly the limitations that this brings to the study. I discuss this in more detail below.

As mentioned above, I am no statistician - by my entry level understanding suggests that the statistical analysis was competently done. The results are essentially summarised in figures 2 and 3. Figure 2 demonstrates the problems associated with subjective comparisons. I think that it clearly does that! Perhaps it would have been better to reduce the number of species shown and increase the size of the individual images – it may have made the point more clearly.

I have to admit, however, that I am at a loss to understand figure 3. It needs a fuller, more detailed, caption explaining exactly what the diagram is showing – as it stands I can't make the link between the diagram and the results outlined in the text.

My uneasiness with the assumption that all the specimens measured are in situ as

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outlined above is addressed to a degree in the discussion. But the argument appears to be somewhat circular. Analysis suggests that a shift to red indicates age and probable reworking, and in line 247 the authors state that the mean red fluorescence indicates that a “considerable proportion of the specimens are in situ”. But how do we know that the rest aren’t also in situ and the technique has failed? The authors seem to suggest that the answer lies in looking at the total assemblage and deciding whether or not sufficient numbers of individuals are in situ to trust the palynological analysis. But I’m not convinced that this gets around the circularity of the argument

The most significant issue I have with the paper is that it left me wanting more - as a practicing palynologist it appears to me that a good case has been made that measuring the mean red fluorescence data of palynomorphs offers the potential to sort out reworking of palynomorphs. But I would like to have seen a short section outlining how it may be applied in a practical sense. The inclusion of this may overcome the issues I have raised.

This work has the potential to be extremely useful, with a little expansion and clarification this paper could make an important contribution to Antarctic palynology.

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