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Atmospheric Measurement Techniques Discussions

Interactive comment on "Application of the ECT9 protocol for radiocarbon-based source apportionment of carbonaceous aerosols" *by* Lin Huang et al.

Anonymous Referee #1

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This paper presents an evaluation of the ECT9 separation protocol for the measurement of radiocarbon in OC and EC. Radiocarbon measurements of OC and EC in carbonaceous aerosols provide a powerful tool for understanding the sources of these materials. Overall, the authors do an excellent job of describing the method, conducting the critical tests for validating the radiocarbon measurements, and comparing it to other standard methods currently in use. I recommend accepting the paper for publication with minor revisions noted below.

Instead of using the term "FM14C", I recommend using the term "F14C" as recommended by Reimer et al. (2004). Reimer, P. J., Brown, T. A., & Reimer, R. W. (2004).

Discussion: Reporting and calibration of post-bomb C-14 data. Radiocarbon, 46(3), 1299–1304. A better acronym for pyrolyzed organic carbon might be PyOC; the term POC means particulate organic carbon for researchers in the aquatic sciences.

Line 112. Rewrite "The fraction are separated based on their thermal refractory."

Section 2.3 There is a lot of detail in this section and some of it could be removed but osme of it enhanced. I am not clear as to how you load dissolved material onto a filter without losing some of it. Please explain.

Lines 210 on. There is a lot of reliance on the Santos et al. 2007 paper for assigning errors to the amount of extraneous carbon added during sample preparation. I'm sure more work has been done since then although perhaps not published. It might be useful to mention this unpublished work. However, an assignment of $\pm$50% is very conservative and hard to argue with.

Line 219. Please better define what "14C analysis" refers to. Is it from graphite prep on or does is start later in the process.

Line 232. How was the mass determined at the CAIR lab? Is it from the integration of the OC/EC signals or from manometry? If it is from manometry, it is not a great comparison and probably does not warrant a figure.

Line 244 on. The data seem a bit iffy below 10 μg.

Line 260. I think it is optimistic to state that the technique is good for samples containing as little as 2 μg C. It definitely seems robust for samples containing >10 μg C and appears useful down to 5 μg C.

Lines 270-279. I am a little confused about the discussion of the rice char. If 14% of the carbon in the rice char is OC and rice char is modern, it would be expected that you would find modern carbon in the combined OC sample. The question is whether a mass balance indicates that the measured fraction modern is what one would expect.

Is it possible to redraw Figure 8 so that it is possible to see the peaks as robust features?

Lines 325 on. I find the comparison of the SRM 8785 analyses using the ECT9 and Swiss_4S protocols not as compelling as the previous figures. The results for the Swiss_4S protocol are difficult to interpret and more discussion is warranted. It certainly looks as though it would be very challenging to isolate OC from EC in the final peak in Figure 9C.

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