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Atmospheric Measurement Techniques Discussions

Interactive comment on "Evaluation of a 2-step thermal method for separating organic and elemental carbon for radiocarbon analysis" *by* U. Dusek et al.

S. Szidat (Referee)

szidat@dcb.unibe.ch

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This work describes an optimized setup of a combustion system for separation of OC and EC for 14C analysis, which bases on the concept of the THEODORE method. The thorough evaluation and optimization of this method results in a protocol that is similar to the recent studies of Bernardoni et al. (2013) and our group (Zhang et al., 2012). As these three investigations were done independently and used partially different techniques to justify their conclusions, the joint outcome can be regarded as sound. I recommend publication of this work in AMT after consideration of the following comments.

General comments:

1. I cannot comprehend the reason, why the authors chose the term "refractory carbon (RC)". At the end of page 134, they refer to the convention paper of Petzold et al. (2013), which in fact recommends not to use new terms in studies of carbonaceous particulate matter. As a consequence of this, "EC" is still the correct term to me, even if EC cannot be recovered quantitatively and the rather refractory fraction of it is analyzed. If the authors like to stress this point, the usage of an index (e.g. ECref) may be acceptable, which still seems to be more elegant than the usage of RCe (extracted RC). This would omit confusions as on page 135, line 27, where refractory organic material (ROM) is introduced, which is a fraction of OC, whereas refractory carbon (RC) should be a fraction of EC. The similarity between ROM and RC is too close and may remind the quick reader of the fractions OM and OC, which a represent the same portion of the carbonaceous aerosol, whereas ROM and RC do not. Furthermore, the authors themselves come back to the term EC, e.g. on page 136, lines 10 and 17.

2. In the context of the previous comment, I recommend reporting 14C measurements of EC a) as the measured value together with b) the EC recovery for the sample and c) the extrapolated 14C(EC) for 100% recovery according to Zhang et al. (2012). c) is necessary, as the measured 14C(EC) strongly depends on the extraction recovery with a trend to more fossil values for lower recovery as indicated in Fig. 7. For interpretation of the radiocarbon analysis of EC, however, the total EC is relevant and not the occasionally extracted fraction of it.

Specific comments:

3. Page 133, lines 4-6: This sentence needs improvement.

4. Page 135, lines4-5: "refractory and organic carbon" in line 5 should be substituted by "these fractions. Line 8: "organic carbon" and "refractory carbon" should be removed.

5. Page 136, lines 22-24: How easily can these pressure conditions be adjusted and

kept constant? Which kind of needle valve do you use?

6. Page 140, lines 5-9: We had bad experience with soaking the filters. Particulate matter was dislocated on the filter surface leading to inhomogeneous loading after the procedure. We even observed statistically significant losses. Therefore, we applied the dynamical water extraction as described in Zhang et al. (2012) instead of soaking. How did you evaluate that only a small fraction of insoluble material was lost (line 8)?

7. Page 140, line 25 to page 141, line 2 and page 144, lines 12-15: How did you transfer the HOxII and the graphite standards onto the filter – as dry material or as solution/suspension? If you used a solution/suspension, did you perform the blank subtraction described on 144 for the standards as well? What was the F14C value of the water and ethanol blank? How can you assess the blank from water extraction using HOxII and graphite, as both substances will be removed during water extraction (HOxII by dissolution, graphite by dislocation during soaking)?

8. Equation 4: I assume that you determined measurement uncertainties for this calculation using error propagation. These should be shown in Fig. 3 and discussed in the text.

9. Page 146, line 7: I propose to add at the end of this sentence: ", especially after water extraction (Bernardoni et al., 2013; Zhang et al., 2012)."

10. Page 149, line 5: It should read "Poeschl, 2005".

11. Page 151, lines 1-2: Are the filters CA2 and CA18 specified in the methods section? I could not find it.

12. Tables 2-4 should be moved to the Supplementary Material or removed completely.

13. Caption Fig. 3: It should read "HOxII".

14. Caption Fig. 7: It should read "/TC) of". The explanation of the last sentence is misleading and should be improved. The difference between Fig. 7a and 7b should be

explained including the usage of the two different filters.

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