

Interactive comment on “Aerosol mass closure and reconstruction of the light scattering coefficient over the Eastern Mediterranean Sea during the MINOS campaign” by J. Sciare et al.

Anonymous Referee #3

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This paper presents chemical, physical (mass) and optical (scattering) measurements made at two sites in the eastern Mediterranean (Crete) with two main goals: (1) Can aerosol mass closure be obtained for this data set (2) What are the mass scattering coefficients required to achieve scattering closure from the chemical measurements? While the methodologies used in the paper are not new, it is interesting to see them to applied to a data set in which both bio-mass burning and dust aerosol play a significant role. The paper is of good scientific quality and the scientific questions raised below are mainly for clarification of some of the methodologies.

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General comments: What is the cutsize of the 0.4 μm pore size filters - would it cause you to miss mass contributing to scattering?

How was the 1-2 μm cutoff for the nephelometer achieved? (impactor? cyclone?)

Is the variation in cutoff due to changes in relative humidity?

What uncertainty does this non-sharp cut-off introduce when trying to reconstruct scattering?

Nephelometers often heat their sampled aerosol due to the nephelometer light source. This heating will result in lower than ambient RH in the nephelometer and thus lower than ambient scattering measurement if water is involved (as is the case here). How was this heating in the nephelometer taken into account and/or what uncertainties in reconstructed scattering will it introduce?

I'm confused by the discussion of the sea salt reactions and subsequent volatilization of HCl. The paper says this chemical reaction/volatilization process will make the use "of NaCl to describe seasalt in admissable, as well as the equation 'seasalt = 3.27Na' ". From the description it seems like using Cl to define seasalt would be problematic since some of it has volatilized, but that the Na is all still there. Indeed, on the next page the authors use Na calculate the seasalt contributions of other constituents (e.g., sulfate, calcium and potassium). If this can be done, then why can't the equation 'seasalt = 3.27Na' be used?

In the discussion of Inorganic Ions, the authors used the following equation to describe [Ammonium Sulfate]: [Ammonium sulfate]=[nss-SO₄]+[NH₄]. Ammonium sulfate is a specific molecule: (NH₄)₂SO₄, but I'm not sure if the authors were specifically referring to ammonium sulfate with this equation or just to various molecules containing sulfate and ammonium.

I felt that the free troposphere (FT) site got short shrift in this paper. I'm not sure if this was because the data set was of lower frequency or for other reasons. I think it

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would be interesting to do the same mass closure experiments for the FT site since it occasionally got more dust than the MBL site.

I could not tell from the text which gravimetric mass measurements were used for the mass closure experiments - the MOUDI data or the SFU data. I assume the SFU data since that's where the chemistry data came from and it would be on the same frequency as the chemistry data. Regardless, this should be clarified.

The authors suggest that the OC to POM conversion factor changed over the course of the study and that their constant value of 2.1 may not be applicable for the entire data set. They present strong evidence to support this claim, however they don't ever actually give separate conversion factors for the two periods of the study. They should!

This is a niggling comment, but I don't think that the authors are 'reconstructing scattering' so much as 'deriving mass scattering coefficients'.

Technical corrections page 1, line 19-20, rewrite sentence: "Comparison between the MBL and FT sites showed a slight vertical gradient for PM that was not..." change to: "This slight vertical gradient for PM was not..."

page 2, line 9 change the phrase 'expressed through' to 'related to'

page 2, line 10 give a reference for radiative forcing related to chemical composition

page 2, line 10-11 change phrase 'one of the most' to 'an'

page 2, line 15 change phrase 'are more and more required as the will serve' to 'have been used'

page 2, line 19 delete words 'these' and 'will'

page 2, line 22 add word 'to' in phrase 'which occurred TO the west'

page 4, line 17 I believe the reference is 'Birch and Cary' (one 'r')

page 4, line 21 intercomparison is spelled wrong

page 4, line 27 add word 'of' to phrase 'quantitative use OF this'

page 6, line 6 change 'samplings' to 'samples'

Table 2 - perhaps include factor type (e.g., biomass burning, marine etc) on table

Figure 5 - have x-dimension be same size as Figure 4 so reader can see where BC/TC ratio changed in Figure 5 as well. Also - the gravimetric mass line has a different symbol than what is given in legend (open diamond vs filled triangle)

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 2427, 2005.

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