Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-601-RC1, 2017

Atmospheric Chemistry and Physics Discussions

ACPD

Interactive comment

Interactive comment on "Atmospheric Water-Soluble Organic Nitrogen (WSON) in the Eastern Mediterranean: Origin and Ramifications Regarding Marine Productivity" *by* Münevver Nehir and Mustafa Koçak

Anonymous Referee #1

Received and published: 25 August 2017

Review of Nehir and Koçak This paper reports analyses of a very large set of aerosols and a small set of rainwater samples for major ions and water soluble organic nitrogen (WSON) from the Turkish sampling site on the Mediterranean coast. There have been similar studies at this site and at neighbouring sites over recent years, but the very large size of this data set makes this data set useful. The analyses seem to generally have been well done and the interpretation is quite thorough, but there are some parts of the paper that I think could be improved for final publication as described below. Introduction There have been some recent reviews of WSON which the authors might

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Discussion paper

reference (e.g. Cape et al., 2011 Atmos. Res 102, 30-48) since they summaries much of the material and offer a somewhat wider perspectives and more recent information on the composition of WSON. There is also now a global model of WSON (Kanakidou et al., 2012 Global Biogeochem. Cycl. 26, doi 10.1029/2011GB004277) which has contributed to an updated global nitrogen cycle revising the Duce et al 2008 paper cited (Jickells et al.;, 2017 Global Biogeochem. Cycl. 31, doi 10.1029/2016GB005586). Line 60, while amines will neutralise acids, it is not obvious the rest of WSON will. Line 62 I don't think Twohy discusses WSON Line 80 and later on, there is really pretty clear evidence that the Eastern Mediterranean is P limited. There is a vast body of work by Krom and colleagues that supports this (see most recently Pawley et al 2017 Global Biogeochem. Cycl. 31, 1010-1031 and the earlier summary in Krom et al 2010 Prog. in Oceanography 85, 236-244) and my reading of the Yücel 2017 paper does not actually contradict this view. Line 81-2 It is mentioned a little bit later on, but not here, that Mace et al have reported WSON from exactly the same site as the study here. This should be noted here and also in section 3.1. Note also the reference list lacks dates and while in the text the authors refer to Mace et al a,b and c, these are not identified in the references by these letters. Analytical Methods. In general the results seem to be of good quality, although there is no mention of how blanks were determined (i.e. what procedures were used to create blank samples for analysis), what standards were used in analysis and whether any certified reference materials were used. I do not really understand what the sentence line 163-4 about blanks being <10% means, is this true for all ions?. On line 163 20ppb is ambiguous, is it as ppb nitrogen and why not use molar units as elsewhere in the paper? Section 2.4 discusses the quite well known challenges of estimating WSON and its relatively low precision as a derived quantity (see Cape et al for instance). The precision of WSON depends a lot on the relative concentrations of the three components of the total nitrogen analysis, so it is not possible really to quote a single number. The authors discussion e.g. lines 170-174 and 175 (and lines 221-222) does not really explain what they actually estimate the precision to be. The use of PMF (which I am no expert on) here seems to require provision of precision estimates, but I do not understand how the arbitrary thresholds used here (line 185-7) were arrived at or how sensitive the results are to these values. Section 2.6 As I understand it PMF is a form of principal component analysis and hence is an appropriate tool for this kind of source apportionment. I would suggest the authors may be better putting an explanation of the principal of the method here and putting the highly technical discussion into some sort of appendix, because I think many readers will not really be able to follow this section. Section 3.1 and 3.2 I wonder if these sections could be shortened a bit given that the results are broadly in line with other work in this region Line 304-307 I do not disagree with the interpretation here, but it is worth noting that this does carry the implicit assumption that land based sources dominate the emission of WSON. Section 3.3. This section is very general and the issue is approached in a more quantitative manner in 3.5 and 3.6, so I wonder if the section could be shortened. Section 3.4 Mace et al suggested that the Saharan dust was a major source of WSON at this site and they did this I think by a correlation between nssCa2+ and WSON. Here the association with dust seems to be weaker but the discussion does not really address this point, but simply notes there is an association with dust. This could be discussed further. Section 3.5 In Table 5 the WSON and other parameters are classified into 5 groups, but in the text here the discussion splits the data into two. It would be easier for the reader if the manuscript discussion and the tables did one or other of these, rather than mix them up in this way. Section 3.6 As noted earlier I am no expert on PMF. The striking thing for me from Figure 6 and the discussion, is that WSON does not resolve in any simple way into any of the components identified, emphasising the multiplicity of sources that it has, and this is particularly striking within such a large data set. I would also query the interpretation of what the associations mean (lines 469-474). The authors interpret the results in terms of formation mechanisms, but an alternative explanation might be emission sources. Section 3.7 As noted earlier the Eastern Mediterranean appears to be phosphorus limited. If this is the case then the addition of nitrogen will not necessarily stimulate any additional primary production, but rather contribute to the high N/P ratio (see earlier

Krom and Pawley references) and so the hypothesis behind the calculation (line 500-509) is flawed and the conclusions about the impacts on new production are incorrect. Section 4. This is really a summary and not a conclusion and simply repeats the earlier material.

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