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Biogeosciences
Discussions

Interactive comment on "Contribution of dust inputs to dissolved organic carbon and water transparency in Mediterranean reservoirs" *by* I. de Vicente et al.

Anonymous Referee #2

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Comment on BG-2012-221

General Comments

This paper explores the direct and indirect influences of water soluble organic carbon from atmospheric deposition – mainly from Saharan dust – on three reservoirs in the Mediterranean basin. This research study addresses connections between the atmosphere and hydrosphere, which are often difficult to assess and little-studied, yet critical to trophic dynamics and biogeochemical cycling of nutrients in the water column. This paper requires some important revisions to further clarify key points (see below) and to fill in some of the broader relevance that is missing. However, the study is novel and

interesting and is of current interest, especially given recent attention to the impacts of dust on alpine snowpacks and climatic and human influences on dust transport.

G1. For the Biogeosciences audience, this reviewer feels that the authors could improve the paper by discussing the wider implications of their research, beyond what is stated in the introduction. Perhaps a Conclusions section or a separate section on Environmental Implications could be added to address what these results mean for other reservoirs in light of projections of future dust transport or severity of dust events, for example.

G2. In tackling the atmosphere-water connection, the paper does well to examine both direct and indirect influences. To examine direct influences, the authors compiled WSOC mass input rates from atmospheric deposition collectors and reservoir morphometric characteristics to show that, in terms of DOC mass, the contribution from atmospheric inputs was fairly low. They also examined the influence of chromophoric compounds on the transparency of the reservoirs and found that the colored compounds in atmospheric deposition did, in fact, change the depth of the photic zone. The greater influence of atmospheric deposition on reservoir optical properties than on DOC mass in the reservoir is an important point of discussion that could be elaborated upon. Is this effect due to the high molar absorption of the WSOC?

G3. Another important result of this study is that the indirect influence of dust inputs on reservoirs may be very important in lakes with certain biogeochemical (P limitation) and morphometric characteristics. In particular, the explanation of synchrony in two of the reservoirs that may result from phytoplankton stimulation by dust (bottom of page 8316) is well thought out. The evidence of P limitation in those reservoirs, but lack of P-limitation in the third is very convincing. This section is exciting to read and could be highlighted better in its own separate section on indirect effects (see comment S3).

Specific comments S1. For each reservoir, the authors perform a fairly novel calculation of the depth at which transparency is reduced by 10% (compared to the surface).

This appears to be a useful and quantitative measure of chromophoric compounds in atmospheric WSOC influence lake transparency by absorbing light. However, the method is not explained in sufficient detail and it is difficult to understand how a difference could be calculated when there is no baseline for conditions without dust. For example, since the reservoirs are continuously being bombarded by dust, how are the authors able to extract the dust influence from pre-dust conditions and from other influences such as CDOM from bacteria and algae? Also, the influence of photobleaching is discussed in the context of reservoir CDOM observations. How is photobleaching accounted for in the calculations for z10%?

S2. The final paragraph of the introduction on page 8310 should be revised so that it contains more of a thesis statement. For example "Our goals or objectives were to. . ."

S3. For clarity, one approach may be to separate the Discussion section into subsections covering 1) direct and 2) indirect influences of dust on these reservoirs. The authors do well to highlight these differences in the abstract. The indirect effect of atmospheric deposition on reservoir DOM and water transparency is mentioned in at least two places in the discussion, but it is somewhat buried and it seems that the result would have more impact if it was highlighted in a specific sub-section.

S4. There are many errors in English usage and grammar. Some have been noted below. Missing "the"s have been listed up to page 8309. After that, the authors should carefully comb the text for other omissions. There are also some errors in spelling or diction/word choice – eg. "synchronic" and "contrarily", which should be "synchronous" and "in contrast to", and those should be corrected throughout the manuscript. Agreement between plural subjects and plural verbs is also a problem and should be addressed.

S5. The Study sites sub-section should provide more information about the setting. The river mentioned is in southern Spain; can it be assumed that the reservoirs are also in southern Spain? Are they near a city? Are there other DOM inputs to be aware

of? Also, why are there no molar absorption coefficients for wet deposition? This should be described in the methods, or as a footnote to Table 2.

S6. The methods should list the precision of analyses or some measure of error associated with the analyses.

S7. The titles of table 2 and 4 should specify that the range is given in parentheses.

Technical corrections: 1) Page 8308 line 20: decreased from what time or original value?

2) Page 8308 line 24: "the" is missing in front of "global carbon cycle" and "since they" should be "since the lakes"

3) Page 8309 line 2: "into" should be "in"

4) Page 8309 line 4: "is" should be "are". This first sentence is not clear

5) Page 8309 line 6: "the" is missing in front of "exchange". What is meant by "Then"? When?

6) Page 8309 line 13-14: This sentence is very difficult to follow. Please clarify. On Line 14, what information is lacking?

7) Page 8309, line 18: "the is missing in front of "Mediterranean".

8) Page 8309, line 23: "vulnerable" instead of "exposed"?

9) Page 8309, line 24: "the" is missing in front of "Sahara"

10) Page 8309, line 27: should read, "nutrients, such as soluble phosphorus, that stimulate both"

11) Page 8310, line 5: should read "reservoirs that were approximately 40 km apart and"

12) Page 8310, line 7 and 8: sentence is difficult to follow.

13) Page 8310, line 12: which forcings, please specify

14) Page 8310, line 25: “located in” not “on”

15) Page 8311, line 6: “in contrast to” rather than “contrarily”

16) Page 8311, line 7: “which are” instead of “which is”. What is meant by “lastly”?

17) Page 8312, lines 9-16: These methods should be explained in greater depth. Perhaps an equation should be added, such as that of Morris et al.?

18) Page 8314, line 3: What exactly is meant by climate forcing?

19) Page 8314, line 19: the definition of molar absorption coefficient should be in the methods.

20) Page 8315, line 21: “synchronous” instead of “synchronic”. The latter is used for languages and music. Check for this throughout the manuscript.

21) Page 8316, line 17: “understood” instead of “acknowledged”

22) Page 8317, line 21: “should be “agricultural land. Therefore, the amount”

23) Page 8317, line 23: this is unclear, what are the implications of the catchment to reservoir area ratio being higher? This thought needs to be completed.

24) Page 8318, line 7: This is not clear. Perhaps a “For example, a 9m increase in depth resulted in. . .”

25) Page 8319, line 10: A new section with conclusions or implications is needed here. What are the implications for other shallow and oligotrophic reservoirs in terms of water quality, trophic dynamics- primary production and heterotrophy, light attenuation and UV protection?

Interactive comment on Biogeosciences Discuss., 9, 8307, 2012.