

## ***Interactive comment on “A fine fraction of soil used as an aerosol analogue during the DUNE experiment: sequential solubility in water with step-by-step decreasing pH” by C. Aghnatiou et al.***

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Received and published: 9 May 2014

We thank the reviewer for their work on our paper intitled "A fine fraction of soil used as an aerosol analogue during the DUNE experiment: sequential solubility in water with step-by-step decreasing pH".

Our response on both reviewers is on the attached pdf file.

Referee #1: You use certified reference material SLRS-4 from NRC, Canada. However, I've been perusing in the NRC web and only could find reference material SLRS-5 (River water reference material for trace metals). Was this one the one you used? Because old CRMs are wiped out of the NRC web site, we added references in which

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relevant data are reported (Yeghicheyan et al., 2001; Heimbürger et al., 2013).

Did you use any reference material for P? P is not certified in SLRS-4. However, we used measurements from SLRS-5 (Yeghicheyan et al. 2013) and elemental composition ratio between SLRS-4 and SLRS-5 to validate our measurements of P. P is also reported in Yeghicheyan et al 2001 for SLRS-4 but with a higher value which seems false. Only one laboratory (situated at Toulouse) measured P in SLRS-4. Our calibration line for phosphorus was made with pure dry sodium hydrogen phosphate salts dissolved in water and diluted. Sodium content of the solutions was found equal to the stoichiometry and a commercial 10mg/L solution was diluted to 1000 µg/L to check our calibration slope. P concentration determination in SLRS-5 is better than in SLRS-4 because it used more recent technics and as described in Heimbürger et al. 2013, SLRS-5/SLRS-4 ratio measurement is completely insensitive to calibration issues. For these reasons, we trust better new SLRS-5 measured values than old SLRS-4 and used well determined SLRS-5/SLRS-4 ratio to validate our P measurements based on SLRS-4 checking. We modified the paragraph to include this discussion.

Page 2627 line 19. Specify how the calcium index of dust is calculated. We have removed this term which is not commonly used and not necessary here. In the new sentence we only state that dust sourced from Tunisia has high calcium content.

Page 2628 paragraph 5-10. You comment here the pH results from the leachings. The actual data are provided in Supplement Table 1. However, my opinion is that a Table containing the results is needed here. I suggest to include here a Table with the averages of the pH values and the nutrient solubilities in the 3 leachings at each pH step. To emphasize the differences between the 3 results you can also provide the range of values. The supplementary reading is moved to the text as Table 2. A 3rd column is added to table 1 showing the elemental composition rather than oxide to remove completely supplementary reading. We added a line with detection limit (DL) as requested by Referee #2. To be comparable with DL which is an uncertainty, we changed standard deviation SD in uncertainty (U):  $U = 3 \cdot SD / 2$  where 2 is the square

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root of 4, the number of replicates we displayed on average. In the discussion section, we also changed SD in U.

Page 2628 paragraph 15-20. The sentence starting with “Gleyzes et al (2002) and ending with Filgueiras et al 2002” is confusing. Please clarify what is stated by which of the authors. Done. Both write the same behaviour of carbonate. Filgueiras add a consideration to the 5 hours dissolution time which is not useful here and has been removed.

Page 2630 paragraph 0-5. There is an error in the Mn%, since 21% corresponds to pH1 (from data in Fig 3) and here this value is attributed to pH3. At pH3 the solubility of Mn is 18%. Once this is corrected, one can see that the comparison between results from leaching with solution pH3 and results from processing with synthetic cloud water (as reported in Wuttig et al 2013) are not that similar: for Mn and Al, pH3 solubilities are about half those obtained with cloudwater (if we take 34 as a medium value for the range 27-41 % for Mn in cloudwater). On the other hand, for Fe the solubility at pH3 (from data in Fig 3) is about double that of the cloudwater processed dust. Could you comment on that? We have modified the text and based our comment on an average behaviour of Mn, Al and Fe, taking into account large uncertainties in the solubility determinations in mesocosms.

Minor corrections Page 2625 Line 11. Instead of “These leaching tests”, write “The leaching tests reported here” Done Page 2630 line 4, instead of “let us assume” use “indicates” Done Page 2630 line 26, instead of “without invoking...” use “with the acidic conditions typical of cloud water”. We write both “with the acidic conditions typical of cloud water and without invoking extreme acidic conditions” Page 2630 line 27, instead of “liability” use “lability” Done

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/11/C1546/2014/bgd-11-C1546-2014-supplement.pdf>

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Interactive comment on Biogeosciences Discuss., 11, 2623, 2014.

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