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Interactive comment on "^{17}O-excess traces atmospheric nitrate in paleo groundwater of the Saharan desert" *by* M. Dietzel et al.

Anonymous Referee #3

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This paper presents a novel study using Δ17O to trace the atmospheric origin of nitrate in paleo groundwater. This study is well planned and the evidence to support the main conclusions is convincing. The paper is generally well written and I support its publication, but some clarifications are need.

1.Page 20091, line 5, 6, and figure 5: It is not clear how the δ15NNO3 and δ18ONO3 in desert deposition help explain your data here. All your data in this figure are close to the range of soil nitrogen rather than the nitrate in precipitation. I don't think you can say the nitrate in groundwater is impacted by atmospheric deposition just based on this figure. Your strongest evidence for the atmospheric source is Δ17O. So I think you should bring up this evidence first, then talk about their relationship with desert nitrate deposition.

2.Page 20091, line 15-16 and Figure 7a: The green dashed line in Figure 7a is a regression for all nitrate data, not just the data of this study. The data of this study actually follow slightly below this line, which could be due to MDF as the authors pointed out. I think the authors should make it clear how their own data compares to this line and what that means.

3.Page 20093, line 5-15: Like the other reviewers pointed out, the authors should discuss other possibility for the distribution of x[NO3-]atm.

4.Page 20094, line 1,2: Not the best way to express this. Maybe you can just say "local distribution of x[NO3-]atm", but x[NO3-]atm needs to be clearly defined.

5.Page 20094, line 23-24: The authors mentioned four possible sources of nitrate in groundwater (anthropogenic, evaporite dissolution, leaching from soils and atmospheric deposition). Here the authors conclude that the remaining nitrate relates to microbial sources. I think it should be made clear where the remaining nitrate is actually from. Is it synthesized by microbes within the groundwater or leached from the soils?

6.Figure 5: The references for the range of each box should probably be added to the figure caption (they are currently in the text).

7.Another question: how mobile are these groundwater? How well are these atmospheric isotope anomalies preserved? Would the distribution of x[NO3-]atm be affected by influx and export to other areas?

Interactive comment on Biogeosciences Discuss., 10, 20079, 2013.