

## ***Interactive comment on “Organic nitrogen in precipitation across Europe” by J. N. Cape et al.***

### **Anonymous Referee #2**

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#### General comments:

The paper presents methods to estimate organic nitrogen concentration in precipitation and wet deposition, as well as results obtained across Europe. Since organic nitrogen represents a significant part of total nitrogen, classical approaches taking into account inorganic nitrogen only lead to biases and underestimates of deposited nitrogen. The presented results are new at the whole European scale and deserve publication in Biogeosciences. The paper is well-written and clear except a few sentences (see “Specific comments”). The following points need to be addressed before publication.

The results section is not enough detailed and figures are missing to make the reader able to evaluate the results and the discussion (see details below). Only one figure is included and it presents results on inorganic N, whereas the paper addresses organic N in the title.

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Several protocols are described in the methods section and a large part of the discussion deals with these protocols. Choosing and discussing the protocols is a very important issue in such a study. Methods of sampling and analysis may lead to large uncertainties, especially when organic N is calculated as the difference of two measured variables (total N and inorganic N). Results of method comparison must be deeply presented with a more robust statistical analysis.

The last discussion section (4.2) presents a comparison of the results obtained for organic N with several references corresponding to local or regional results. However, there is no discussion dealing with spatial patterns at the European scale according to natural and anthropogenic characteristics of the sites/regions. Such a discussion would bring a new contribution at the European scale in comparison with individual/local results.

#### Specific comments:

p.8094, l.8: seasonal trends are not shown in the paper (see below, to be presented in the results section).

p.8094, l.9: “simple statistics”: the statistical analysis must be more detailed in the results section (see below).

p.8094, l.10: “organic N vary in precipitation across Europe”: the discussion has to be extended (see “General comments” and below).

p.8095, l.7-21: this part should be at the beginning of the methods section. This section 1 “Background” should be renamed “Introduction” and end by a clear statement of the objectives of the paper, instead of starting the description of the methods.

p.8095, l.8-9: what are the characteristics of the “Level 1” sites? The reader may be not familiar with the NitroEurope project. Moreover, the authors mentioned “Level 3” sites (Table 1 caption) and other data sources obtained by other research groups (section 2.2). Data origin should be presented clearer. Are Level 3 groups and other groups the

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same?

p.8098, l.14-18: a scatterplot and more summary statistics (for instance RMSE, standard deviation) are needed to make the reader able to evaluate the results. R<sup>2</sup> is not sufficient to represent the distribution of values.

p.8098, l.20-25: section 3.2 must be extended by presented seasonal patterns graphically, in particular N concentrations. "Significant (P<0.05) seasonal patterns. . ." needs more explanation.

p.8099, l.1-10: see previous comment, section 3.3 must also be extended.

p.8099, l.16-17: the sentence "small, apparently negative. . .to avoid bias" is not clear, not enough explicit. Be clearer, develop.

p.8100, l.1-2: slope and intercept are not sufficient to judge the regression (see previous comments).

p.8100, l.13-14: to which result refers this sentence?

p.8101, l.12-13: the sentence "By contrast. . ." should refer to a figure. The reader cannot evaluate ranges and geographical patterns of WSON concentrations. It should be useful for a paper entitled organic N across Europe.

p.8101, l.15-23: a deeper discussion towards geographical patterns across Europe is expected (see general comments). The comparison with local results is interesting, but a general discussion on geographical patterns in relation with site characteristics would be a worthwhile contribution.

p.8102, l.11: add total in deposition of "total" nitrogen.

p.8102, l.17: give some insights on how to revise critical loads.

p.8102, l.19-23: both sentences are not clear and should be reformulated.

p.8109, Fig.1: identify the different sources of data (Level 1, Level 3, other EU sites)

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since the presented results correspond to different methods of sampling and analysis. Replace mg N.L-1 by mg N l-1.

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