

Interactive comment on “Analysis of the distributions of hourly NO₂ concentrations contributing to annual average NO₂ concentrations across the European monitoring network between 2000 and 2014” by Christopher S. Malley et al.

Anonymous Referee #1

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This was a very comprehensive review of European NO₂ measurements 2010-2014. Just some minor corrections for readers not so familiar with cluster analysis and other concepts. A few general comments may help the authors to explain some of the concepts a bit more clearly:

Cluster analysis using hourly and monthly averages: Section 2.1 line 27: mention the hourly and monthly average contribution to the annual average NO₂. This is how the

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cluster analysis is calculated. Could you explain how sometimes an hourly contribution might be more or less important? Does it pull out the sites that have large diurnal variability and those that stay the same. What factor is fed into the cluster analysis? Difference between hourly concentration and annual average and difference between monthly and annual? Section 2.1 Line 12 – make clearer how the 5 $\mu\text{g m}^{-3}$ bins are different to the 10 $\mu\text{g m}^{-3}$ bins. I will come back to this in Fig 6. Section 2.1 Line 14- can you explain what “state” statistics is? Would a Figure in the appendix showing what a cluster analysis looks like, with the branches shown and the regions in S8 put in blocks along the x axis and coloured even if we cant see the individual station names be useful? Referring to Figure 1 doesn't really help the reader so much in explaining what a cluster analysis does and looks like? In Fig 4, 5 and 6 with the explanations of what type of sites generally each cluster is made of, it is not easy to work out what the difference is. Maybe you justify in the end that there is no difference between them in most of these figures, so the cluster analysis is not specific enough to understand the characteristics of any one station?

% contribution to NO₂AA 2.1, p.5 Line 26: This is used throughout and is not entirely clear. % contribution to NO₂AA from each month of the year and hour of the day. Somehow I am left not entirely understanding how this was done – could it be explained better? Five , ten and fifteen 5 $\mu\text{g m}^{-3}$ hourly NO₂ Please explain this on p.8 line 19 and p. 9 line24 and in Figure 6. Has this analysis added a lot to the analysis. If you keep in, please explain how this is done a bit more clearly.

Trend analysis You look at 2000-2014 trends and compare how most recent (2010-2014) levels can see different trends from the past to the present. Have you explained how inferring a trend from the past against a level at the end of the trend may not be directly correlated to a trend forwards from now? It seems like it may be more useful to look at the 2000-2004 NO₂ levels and then show whether they increased or decreased. We don't want you to do that again but just justify why the end period is useful in understanding the trend up to that point

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Figures 8 and 12 are very different. Are they at odds with each other? Have you compared them? Fig 12 shows a strong linkage between NO₂ level and increases or decreases and Fig 8 seems to say that there are no significant trends

Specifics: 1. Intro p.4 Line 20: New sentence: This work p.4 Line 22: I would have liked more of an explanation for Fig 1 but maybe not all readers would p.6 Line 12. . . . in each of the 201-2014 NO₂aa bins. . . p. 9 Line 28. . . between 60 and 70 $\mu\text{g m}^{-3}$ (gap) 4 Discussion: p.12, line 5 and 6. Cant this be summarised into “there is a not a regional correlation in the clustering”?

Figures Fig 2 - > 80 is clearer than 80+ Fig 4 a - >80: would be nice to label the site name in the legend/ caption?! Fig 4b line 5 caption: . . .the sites shown as.. Fig 6-comments earlier Figure 9- Zoom in (as there is nothing in N Scandinavia , N Africa, Atlantic, Eastern Europe). >80 is better than 80+. Either there are too many colour bins or it is too difficult to see the difference between a green colour and blue. It looks like green is inside but there is no green in the legend. Very difficult to see beyond the orange or green outer circle Figure 10,11 and 12- a,b,c- h is a bit hidden on Figure-move above

Appendix Figs S1-S7 could be smaller and put into one figure a- g?

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