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Interactive comment on "Recent satellite-based trends of tropospheric nitrogen dioxide over large urban agglomerations worldwide" *by* P. Schneider et al.

Anonymous Referee #1

Received and published: 28 October 2014

In their paper "Recent satellite-based trends of tropospheric nitrogen dioxide over large urban agglomerations worldwide", Schneider et al. report on NO2 trends derived from SCIAMACHY satellite observations over megacities and large agglomerations. They give results for 66 regions, provide a brief statistical analysis of the distribution of trends, investigate the average behaviour of NO2 in all agglomerations combined and also separated by geographical region, briefly investigate the impact of spatial resolution on the derived trends and finally analyse the link between population growth and NO2 change.

NO2 is an interesting proxy for air pollution and one of the atmospheric composition

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parameters which can be observed well from space. Previous publications have highlighted large changes in tropospheric NO2 amounts over the last 15 years but have not covered as many individual regions as this paper. As I'm sure that this overview (mainly Table 3 of the paper) will be of interest to many readers, and because the study is well written and sound, I can recommend it for publication in ACP after consideration of the points made below.

General Comments:

- The amount of new material in this manuscript and the progress beyond the state of art (and beyond the last paper of the same authors) is rather limited, and one would hope that a follow-up publication on a topic so thoroughly investigated in literature as NO2 trends from satellite would contain more original data and conclusions.

- The link to the MACC-II project and thus the Special Issue is limited to the source of funding. The paper does not discuss in any way the connection to the COPERNICUS system, presumably because there is none, and I think it should not be part of this Special Issue.

- Throughout the paper and the figure captions, the authors use the term "concentrations" where they really mean "tropospheric columns". This has to be corrected.

- Figure 1 is nice but has two problems that the authors should fix:

  1. There is a clear stripy pattern visible which is not present in other SCIAMACHY NO2 figures published in the literature.
  2. There is clear indication for a shipping signal between Central America and Europe. To my knowledge, this is an artefact which should not be present or at least should be mentioned in the figure caption.

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- The 2008 drop in Figure 4 is obvious and tempting to link to the economic downturn. However, if we believe this, what is then the explanation for the rapid increase in 2004?

- As this study uses values from individual grid cells, it would be good to add information how exactly the SCIAMACHY observations were mapped into the grid.

Specific Comments:

- p24313,l2: "strongly increased emissions" – relative to what?

- p24314,l17: ERS-1 => ERS-2

- p24315,l2: using method => using a method

- p24316,l14: in spite of its name, SCIAMACHY does not have imaging spectrometers so I'd suggest to drop "imaging" here

- 24318,l11: statistic model => statistical model

- p24318,l21: it might be worthwhile to mention here that the seasonality is assumed to be constant over time

- p24319,l17: Adding 10^{15} here doesn't make sense as the units just have to be the same as for the mean columns.

- p24319,l20: Is VCD_{trop} deseasonalised?

- p24321,l12: value => values

- p24321,l17: "most rapidly increasing trend" – I guess not the trend is increasing but the columns

- p24325,l24 "politically motivated emission reductions" => suggest to rephrase this to something like "emission reductions linked to changes in legislation"

- p24326,l20: Something is wrong with this list – 45 sites have statistically significant trends, of those 34 increasing, 24 of which are statistically significant?

- p24327,l6: characteristics patterns => characteristic patterns

- Table 2, what is N?

- Figure 2: studies urban => studied urban

- Figure 3: trend over => trends over

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