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## ***Interactive comment on “Variability of levels of PM, black carbon and particle number concentration in selected European cities” by C. Reche et al.***

### **Anonymous Referee #1**

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General: The information presented in this work is interesting and worth publication. The paper presents interesting similarities and differences in the variability of levels of PM, BC, N and several gaseous pollutants in seven urban areas over Europe.

The title describes what is done: variability of air quality measures is shown. From the title a reader would however not guess the true contents and messages of the paper. Namely: a) BC is a consistent tracer that reflects the impact of road traffic on air quality and BC should therefore be measured in air quality monitoring networks. And b) levels of N vary simultaneously with gasses related to traffic emissions in central and northern Europe but in southern Europe secondary aerosol is produced because

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of (a.o.) dilution and solar insolation. As a tracer for road traffic emissions, N may therefore not be useful everywhere. A title that contains information like: “new relevant indicator”, “road traffic”, and “air quality monitoring” would possibly trigger more readers (?).

In the introduction the health impact of ultrafine particles is discussed, but the only conclusion (conclusion and abstract) related to UFP is that N variability does not always reflect the impact of road traffic on air quality. The reader may conclude that UFPs are not important (e.g. if not reading the whole paper). Perhaps the authors may find some room to discuss why monitoring UFP is relevant, despite it can not be used as traffic tracer.

In the introduction the importance of BC is only discussed marginally but the articles main conclusion (BC should be measured in (urban) air quality monitoring networks) is related to BC. Moreover, in the 3rd para of the introduction it is mentioned that PM limit values are exceeded and that air quality plans seem not to reduce PM values. The question is raised: “is the efficiency of air quality plans overestimated?” The second question could be “or do traffic emissions not contribute to PM”. The need of a more specific metric to evaluate the impact of traffic emissions on the levels of urban aerosol, comes more or less out of the blue if the importance of traffic emissions on negative health outcomes remains undiscussed. Also in the conclusions (line 14-16) it is mentioned that BC is a relevant indicator for the impact of anthropogenic emissions, but the impact on what and why this is important, remains unmentioned. I suggest to include some text in the introduction that discusses the need of traffic tracer and why this tracer could be BC or N. This discussion should be related to the mentioned limit values for PM and health impacts (sometimes not captured by limit values).

Specific: Abstract 1st para, see general remarks Abstract page 8667 line 24: morning traffic rush hours? Section 2 Methodology. This section basically describes the sites and instrumentation. I suggest to replace the caption. The description of the sites could be more harmonized (preferable). I suggest to include the full city name in the

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captions. (e.g. 2.1 Barcelona, BCN, (urban backgr. . . .etc.) There are three caption for London (2.2-2.4) I suggest to list 2.2 London, Marylebone Road, MR (urban traffic. . . ), 2.3 London North Kensin. . . . Section 2, page 8677, line 6, Suggest to start new section: Instrumentation. Although a discussion of the measurement techniques falls out of the scope of this paper, I would like to see a bit more discussion here. 1) How do the different cut offs of the CPCs impact on the conclusions (mentioned several times as explanation). Last para (page 8678) How BC is converted to EC should be explained a bit more. In the conclusions (page 8692) the influence of coatings is discussed, this discussion should not be placed in the conclusions (caption is not called discussions). Problems with Molybdenum could be discussed in this section, later these problems are used for a possible explanation (page 8680 line 25). Section 3 page 8680 line 4-6. What is happening with BC, other than dilution like CO, at these (time) scales? Aging, deposition? please discuss Section 3.2 daily cycle of atmospheric pollution. Much more is discussed: weekly and seasonal. Suggestion use “temporal variability of atmospheric pollutants” Page 8681, line 21-23 second peak of BC earlier. What should be the mechanism that 150m introduces a timeshift, advection? Please discuss. Page 8681, line 27, “marked differences” I do not find this convincing: see p. 8679 line 25 and p8680 line 4-6. Page 8682 top of page. The referred Fig 2c does not support the statement on its own, a discussion is needed (what is changing and how). Page 8683 line 5. The DAURE campaign is mention, and that no particle growth was seen. I do not see what conclusion is based on that remark. Is it necessary to include (no reference is given, and no supporting figure or number) If it should be included when was the period of the campaign? Page 8685. To me it is not clear what defines S1. The single lowest N/BC measurement recorded or the lowest X% N/BC ratios. Please clarify. “S1 is described as. . . .” continuing next page. Please look at sentence things are said twice. S1 should be interpreted as or really “described”. “formed/emitted” = present? Page 8686 line 10etc., somewhere introduce reference to Table 5. Page 8686, line 11. “derived” caused by/can be explained by/the result of? Page 8686 line 30 why are temperature lower at sunset than at sunrise? Page 8687 line 9, “mean annual hourly

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levels” all data or only S1? Page 8687, line 25, “principally” ?? Page 8689, line 7, parallel cycles of N1 and N2 does not really hold for NK and MR, right? Page 8689, line 8, “no dependence” For SCO I see a clear relation, right? Page 8689, line 19 “progressive accumulation” Do the authors mean that aerosol accumulates in the cities or everywhere. Advection should be strong enough (on a yearly basis) that aerosol emitted will leave the city within a day. Conclusions page 8691, line 7. “Variation of PM does not always reflect. . .” Is this really shown? Conclusions page 8692, line 4-8, new discussion does not belong in this section Conclusosn page 8692, line 9-13, This conclusion only holds for southern Europe, it would be more fair to say that for northern and central Europe N can be used like BC

Technical correction No reference to Table 5 is included

I suggest the native English speaking authors to look at the paper once more.

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 8665, 2011.

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