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**Interactive
comment**

Interactive comment on "The Dynamical Impact of Rossby Wave Breaking upon UK PM10 Concentration" *by* C. P. Webber et al.

Anonymous Referee #1

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The manuscript is describing in detail the influence of Rossby Wave Breaking (RWB) on PM10 daily average concentrations over the central UK. The meteorological data, from which the blocking index were calculated, are obtained from the ECMWF ERA-Interim, while data of PM10 are from station observations for the period 1999-2008. The manuscript is well written, the analysis is well described and sound. I believe that this manuscript should be published on ACP.

I would however appreciate if the authors could clarify few issues and correct minor inconsistencies, so to improve the manuscript even further.

Major comments:

1. I appreciate the work done to create a "super-site". However, few additional infor-

mation would indeed help. A correlation plot between the 3 different sites before and after the "tendency outliers" removal would be great to have, and possibly these should be added on the electronic supplement. I would be very interest to see if the 3 sites do correlates at least after your corrections. If this is not the case, probably the super-site estimations are without any real meaning, as mainly influenced by local emissions.

2. I was not really able to find the information regarding threshold in PM10 concentration in the manuscript of Gehring et al. (2013), i.e. concentration value below which PM10 does not have any health effect. To my knowledge, this is matter of debate, and the World Health Organization writes that: "Small particulate pollution have health impacts even at very low concentrations indeed no threshold has been identified below which no damage to health is observed." (see http://www.who.int/mediacentre/factsheets/fs313/en/). Therefore I do not argue with the thresholds selected in section 2.2, but I would remove the health considerations. See also the discussion in Burnett, R. T. et al. (2014)

Minor comments:

Page 1, line 2 : please mention that only daily PM10 values are used.

Page 2, line 53 : I am puzzled with the "climatological mean sea level pressure", defined here. I think that "climatological" refer to 30 years average. Maybe the authors refers to daily mean sea level pressure as produced by the ECMWF era-interim product.

Page 2, line 54 : Please specify that theta is potential temperature.

Page 5, line 62 : You refer to a correlation between RWB and [PM10]. From your work I understood that the BI was used to represent RWB. I would therefore either

change RWB with BI or specify that the time lag is estimated between BI and [PM10]

Page 6, line 13 : There is an inconsistencies between figures and text. In Fig.3 the caption mention only log[PM10] and not log_e (or ln). However, in the color bar, the absolute values are used (i.e. wihout any logarithmic calculation). Why not using "ln"(natural logarithm) in the entire manuscript? Additionally, in Fig.3 you mentioned that the solid/dashed lines represent regions where the subset average of daily PM10 are higher/lower than the mean of $log_e([PM10])$. Should not be the logarithm in both cases? Alternative you could remove the logarithm in the second case. The text read as the solid dashes are all the regions with the average of subset of daily PM10 higher than 2.3 $\mu g/m^3$!!

Page 8, line 74 : I must disagree, as Sect. 3.1 only showed that without RWB events (i.e. BI lower than 0), PM10 is more effectively removed (transported) due to the zonal flow, while Sect. 3.2-3.3 showed which kind of special RWB could lead to increase PM10.

Page 9, line 15 : I find this paragraph extremely difficult to understand, and I had to read it many times to guess what the author means. Would it be possible to reformulate it?

Page 10, line 55 : Please explain ANOVA acronyms (ANalysis Of VAriance)

Page 12, line 10 : I think you mean [PM10] > $[\overline{PM10}]$ + 10 $\mu g m^{-3}$. However, please check the major comments on this issue.

Discussion :

Would be good for the author to extend the outlook in their discussion :

1. From this work I could also conclude that this should be valid not only for PM10 but also for PM2.5, which are by far mor influenced by transport due to their lower settling velocities. Do the authors have any opinion on that?

2. Could the author extend the manuscript or discuss the absolute frequency of European CRWB ?

Reference:

Burnett, R. T. et al. An integrated risk function for estimating the Global Burden of Disease attributable to ambient fine particulate matter exposure. Environ. Health Perspect. 122, 397–403 (2014).

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