Review for
"The Dynamical Impact of RossbyWave Breaking upon UK PM10 Concentration"
by Webber et al.

Synopsis:

Webber et al. discuss in their study if and how the synoptic-scale weather situation influences the UK PM10 concentrations. This is done based on ananalysis of Rossby-wave breaking (RWB), which is further categorized into cyclonic and anticyclonic RWB and into the air masses associated with it. The manuscript is already quite clearly written, the methods used are well described and suitable to support the scientific findings. Further, the results are of interest to the readership of ACP and I, hence, can recommend publication if some minor concerns and clarifications are handled.

Minor Concerns:

-P2,L54-55: "The pressure dipole results from the meridional advection of upper level air masses with anomalous potential vorticity (PV) characteristics." I think that the link between upper-level PV and the pressure dipole is not immediately clear. A clarifying sentence might help.

- Section 2.1: Please move the formulas to the place in the text where they are referred to. At the moment, for instance, formula (6) is appended at the end of the section, but discussed on top of page 4.

- At **P4,L41** the three measurement sites, being classified by DEFRA as urban background sites, are 'justified' (motivated) by the fact that the majority of UK's population live in urban areas. Further down (L44-48) it is discussed that the sites are influenced by 'urban' activities, and that, therefore, the three stations are combined to remove local spikes. How does this fit together with the motivation? By the way: What is DEFRA?

- **P5,L53 and L61**: "A daily mean [PM10] ([PM10]) exceedance has been defined in this study, when [PM10] exceeds the threshold of 29.72 µgm$_{-3}$ (log$_e$[PM10] = 3.39)" & "The tri-site [PM10] is 19.72 µgm$_{-3}$ or log$_e$[PM10] = 2.98, resulting in an impact threshold of 29.72 µgm$_{-3}$ or log$_e$[PM10] = 3.39": Repetitive?! Further, why does this, in the 2nd sentence, *result* in an impact value?

- **P5,L62-70**: Here the time-lag issue is discussed. It is argued that a time lag between [PM10] and RWB makes sense. But, no time lag is used for negative BI and [PM10]. Finally, the whole paragraph starts with the finding that best correlations result if no time lag is used between RWB and MSLP. The reader can easily get lost in these many different cases! A little remedy could be if the link between MSLP and RWB is not discussed. To me, it sounds rather obvious that the best correlation occurs if no time lag is used. And, by the way, I don't see a need to motivate the RWB time lag by a corresponding MSLP time lag. In short: Simplify the paragraph a little!

- Section 3: This section contains the main results from the study. All in all, the discussion is clear and the results are well supported by the data. However, while reading from subsection 3.1 to 3.2, to 3.3 and finally 3.5 I got a little lost. Many aspects of the link between [PM10] and RWB, positive and negative BI, CRWB and ACRWB, the exceedances of [PM10]... are discussed. I think it would be great to start the whole section 3 with a (rather short) introductory paragraph that, from the beginning, tells the reader where the journey will go to. In short: Give the reader some guidance what he can expect from this section and how the different subsections are connected.

- P6,L20: move formula (7) and (8) to the place in the text where they are referred to.

- **Figure 2 and corresponding text**: In panel b) and c) there are some data points at rather low BI values. I wonder whether these data points, with a considerably leverage, influence the overall fit of the least-square fit? How does the correlation change if these points are omitted? I am also not perfectly convinced that it is reasonable to look at the BI>0 points only (red points and curve fitting) and to deduce that, for instance in panel b), the BI>0 has no impact on [PM10]. Finally, it might be better to use for all four panels the same range for the x axes. This would allow the different locations (GP1-4) to more easily be compared.

- P7,L24-25: "the following longitudinal filter has been applied: 277.5oE < longitude < 77oE in order to focus on regions influential upon UK [PM10]." I do not clearly understand what you mean with longitudinal filter? Do you simply neglect all RWB events in this domain?

- P7,L30-31: Incomplete sentence?!

- P10,L33-35: Repetitive?! Is it the same 10-grid point criterion used before? If so, I would prefer if this criterion is introduced only once in the text.

- P12, L10: "[PM10] > [PM10] + 10 μgm−3" Unclear!

- P12,L15: "The greatest probability of exceeding this studies hazardous [PM10] threshold was associated with a synoptic mechanism identified by an block (probability = 0.383)" Complicated sentence! Please rephrase.