Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-571-RC2, 2016

Atmospheric Chemistry and Physics Discussions

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

Anonymous Referee #2

Received and published: 5 September 2016

1 Overview

This paper presents a new set of insights into the links between pollution events in the UK and synoptic weather. Its novelty primarily lies in the use of 2D blocking diagnostics and their links with PM10 in the English Midlands. The conclusions reached are substantial and the scientific methods used are valid. There is however, some scope for clarifying the presentation, especially for an audience who may not have as much familiarity with dynamical meteorology as the authors.

With some changes, as described below, this paper is suitable for publication in ACP.

2 Specific comments

2.1 Abstract

Please include the probability of PM10 excedences both for days without RWB and for those conditions most likely to lead to an episode. Also make it clear that an exceedence when there is RWB is 3 time more likely than periods without RWB (it is not clear currently what it is 3 times more likely than).

2.2 Introduction

It would be helpful to expand the description of what is meant by Rossby Wave breaking here. Start by a quick reminder of what a Rossby wave is and then give a bit more explanation of what is meant by large scale overturning (and that it is not overturning in the vertical!). A figure similar to Figure 2 of Masato et al 2012 would be useful to better orient the reader and also to help explain the diagnostics in section 2.

When discussing the way that high pressure influences concentrations, is not the suppression of vertical mixing by large scale subsidence also a factor which may play a role?

2.3 Section 2.1

You state the ERA-Interim data has been temporally filtered, but has it also had a running mean in longitude applied as described in M11 and M13? If so please state this, if not explain why.

2.4 Section 2.2

I found the section explaining the exceedance threshold confusing. Please remove the first sentence and start the paragraph with “In this study PM10 exceedances are defined using a threshold based on the results of the European Study of Cohorts for Air Pollution effects (ESCAPE) . . .”

At the end of the paragraph replace the last part of the final sentence (after =2.98) with Therefore we use a threshold for daily mean [PM10] of 29.72 ug/m3 or loge[PM10]=3.39 to define an exceedance.

It would also be useful to put this threshold in context by comparing to EU air quality standards and the UK DAQI for example.

2.5 Section 3.2

It would be useful in paragraph 1 to summarise in the text what the four RWB types are.

The final sentence of the final paragraph is crucial to understanding the following sections of the paper and needs to be more explicit. Something like “Therefore in all subsequent analyses in this paper, we select only those RWB events occurring in the respective solid contoured regions of influence as shown in figure 3.”

2.6 Section 3.3

The sentence starting: “Fig 4 illustrates . . . that lead to a UK PM10 exceedance the following day” is unclear. Is the PM10 exceedance one day after the MSLP anomaly (2 days after the RWB event) or one day after the RWB event? Please clarify. If it is the former, please give more information on why a lag between PMSL and PM10 was

used.

2.7 Section 3.4

Please include a new paragraph after paragraph 2 to introduce the CDFs here. Describe figure 5 focussing first on the blue and black lines. Then move on to the importance of persistence. It might even be useful to have 2 separate sub-sub-sections for these.

This analysis only covers events with a persistence of 1 day. Have longer periods of persistence been considered or are there too few of these for statistical significance?

2.8 Section 5.2

Would it be appropriate to present the figures from the other observations sites as supplementary material?

3 Technical corrections

- P5, L59 followed -> follows
- P7L49 Subsequently -> This ensures that
- P8, L71 prevalent -> favourable
- P9, L11 Subsequently -> therefore
- P9, L11. Is pre-determined from -> depends upon
- P12, L104. Buchholz et al – missing reference

- P12 L10 missing over bar [PM10]]
- P14, L62. Subsequently -> Consequently

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-571, 2016.