

### gmd-2016-183

**“Spatiotemporal evaluation of EMEP4UK-WRF v4.3 atmospheric chemistry transport simulations of health-related metrics for NO<sub>2</sub>, O<sub>3</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> for 2001–2010” by C. Lin et al.**

### Responses to anonymous reviewer #2 (RC3)

We thank the reviewer for their time spent reviewing our paper. Our responses to the comments made are given below. The reviewer’s comments are reproduced in italics here.

*The paper presents a thorough and well laid out evaluation of the performance of the EMEP4UK-WRF model by comparison with observations from the AURN network based on metrics most appropriate to assessment of health impacts. The assessment is thorough and results are presented for a range of station types, for different averaging periods and for a range of pollutants. Explanations are given and discussed for discrepancies between modelled and observed values, such as the model overestimation of O<sub>3</sub> and underestimation of NO<sub>2</sub>. I believe the paper fits the remit of the journal, as set out in the GMD Aims and Scope, and I recommend some minor revisions be made as follows:*

Response: We thank the reviewer for their endorsement of the thoroughness and appropriateness of the material we present in the paper, and for their recommendation of its suitability for publication in GMD. We have made all requested minor revisions as indicated below.

*Introduction, page 2, line 27-29. The text is slightly confusing since the authors suggest they have undertaken epidemiological studies, although the current paper is not based on epidemiology, rather it is atmospheric chemistry modelling. If the authors are referring to work other than this paper, references should be given at the end of the sentence, or the text made clearer as to what is being referred to here.*

Response: We have both rephrased this sentence to make its message more direct and added a citation to an epidemiological study using these modelling data. The modified sentence now reads (page 2, lines 27-29): “As part of a multi-institution project on the health impacts of exposure to multiple pollutants, we have derived UK-wide distributions of surface air pollution at hourly temporal resolution over multiple years (2001-2010), at 5 km × 5 km horizontal resolution, using the EMEP4UK-WRF atmospheric chemistry transport model (ACTM) (Butland et al., 2016).”

*Page 3, line 17: please clarify daily mean as 24 hour mean here to remove any potential ambiguity.*

Response: The text has been modified at this point to “daily (i.e. 24-h) mean” so as to emphasise to the reader that the use of the phrase “daily mean” throughout this paper refers to the full 24-h mean.

*Section 2.4, page 6: The FAC2 metric is explained here but has been presented earlier in the paper without enough explanation (in Table 1 for example).*

Response: We have checked and Table 1 is the only place where the terminology ‘FAC2’ appears before its definition is given in Section 2.4. Also, although ‘FAC2’ is one of the

column headings in Table 1, discussion of the data in this column of the table does not occur until the Results section of the paper, after the definition of FAC2 has been provided. Nevertheless, we appreciate the reviewer's comment that the reader's attention is drawn to Table 1 earlier in the paper and that this could cause confusion. We have therefore inserted the additional text "(as defined in Section 2.4)" after the text in the caption of Table 1 that states that the table also contains a summary of measurement-model statistics.

*Introduction, line 4: Suggest add references to COMEAP 2009 report for PM.*

Response: The COMEAP (2009) reference has been added to the citations in this sentence.

*Line 18: suggest replace "and away from" with "or away from".*

Response: The requested change has been made.

*Page 14, line 17: "trends" not "trend"*

Response: The requested change has been made.

*Table 1: Some of the abbreviations need expanding (e.g. FAC2) in the table heading since they are not addressed previously in the text.*

Response: The definition for the acronym AURN, the UK Automatic Urban and Rural Network, is now given in full in the caption to Table 1. For the meanings of the acronyms for the measurement-model statistics presented in Table 1 the reader is now directed via the table caption to Section 2.4 where the definitions of these statistics is given (see also response to a comment above).

#### References cited in this response

Butland, B. K., Atkinson, R. W., Milojevic, A., Heal, M. R., Doherty, R. M., Armstrong, B. G., MacKenzie, I. A., Vieno, M., Lin, C. and Wilkinson, P.: Myocardial infarction, ST-elevation and non ST-elevation myocardial infarction and modelled daily pollution concentrations: a case-crossover analysis of MINAP data, *Open Heart*, 3, e000429. doi:10.1136/openhrt-2016-000429, 2016.

COMEAP: Long-term exposure to air pollution: effect on mortality, UK Department of Health Committee on the Medical Effects of Air Pollutants. ISBN 978-0-85951-640-2, <https://www.gov.uk/government/publications/comeap-long-term-exposure-to-air-pollution-effect-on-mortality>, 2009.