

Earth Syst. Sci. Data Discuss., author comment AC1
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Reply on RC1

Samuel J. Tomlinson et al.

Author comment on "Nitrogen deposition in the UK at 1 km resolution from 1990 to 2017" by Samuel J. Tomlinson et al., Earth Syst. Sci. Data Discuss.,
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We thank the reviewer for their comments, which have helped improved the quality of the manuscript. We responded to each comment below.

1. We believe this dataset represents the first time N deposition data in the UK has been made at a 1km x 1km resolution and over such a long time period. The model is not new (as described in Section 2.1) but its application in this way is. The following text was added to L48 to clarify this point,

"It is the first time annual N deposition data has been released at this resolution over this number of years in the UK, using a consistent methodology throughout. The consistent methodology means that the latest knowledge for emission distributions across the whole period can be used, with the latest emission factors used to back cast the entire time series at a high spatial resolution. In addition, model parameters and calibrations for each time step use the same most up-to-date model version. It is envisaged that studying the effects of N deposition on the environment can be aided by such an increase in detail, as suggested by Hallsworth et al. (2010)"

2. The authors have added the following text to the paragraph that ends on L38;

"The main driver for this increased variance of N deposition at higher spatial resolutions, compared to lower resolutions (within the same study area), is the more granular representation of dry N deposition from agricultural sources such as livestock houses, and busy roads or local combustion sources. Dry deposition of N from reduced nitrogen ('NHx') is very local to the emissions sources which a 1km x 1km resolution can more easily reflect. Furthermore, but to a lesser extent, the increased definition in a 1km x 1km rainfall map (for wet deposition) has more variation than a smoothed 5km x 5km rainfall map, while land cover is more readily represented in higher resolutions (which can determine deposition velocities and therefore N deposition)."

3. The authors agree that some more context regarding the performance of the correlations is important, and the following text has been added after L260;

“For context, Carslaw (2011) undertook a model inter-comparison exercise for the UK Department for Environment, Food & Rural Affairs (Defra), with a specific focus on deposition from the CMAQ, EMEP4UK, FRAME, HARM and NAME models. Respectively, those models (at the time) were run at resolutions of 12 km, 5 km, 5 km, 10 km and 12 km. The models reviewed by Carslaw (2011) performed with a similar correlation coefficient (r) for all N compounds, aside from NH₄ and NO₃ in precipitation, for which the 2017 model run in this study had a weaker correlation (0.51 – 0.61 compared to 0.7 – 0.88).”

4. The authors agree and a new figure, Fig 3., has been inserted into Section 2.4.1, showing the locations of the observation sites for the four networks, across four specific years (that were evaluated in Section 3.2). Additional accompanying text was included immediately above Table 3:

“[...], while Fig 3. shows the spatial distribution of the observation sites with measurements in 1990, 1999, 2008 and 2017 (the first year of measurements for each observation network is noted in Table 3). It is believed that this is the first time model evaluation for gases, aerosols and concentration in precipitation has been done across a long time series at multiple points in time on the same dataset.”

5. We agree, and Figure 8, now Figure 10 in the reviewed manuscript, has been changed to show the N fraction label close to the line that represents it.

Many thanks