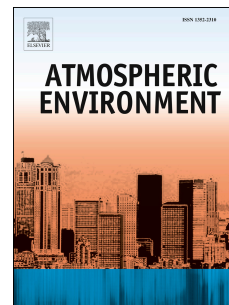


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Impact of temporal upscaling and chemical transport model horizontal resolution on reducing ozone exposure misclassification

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1 **Title: Impact of Temporal Upscaling and Chemical Transport Model Horizontal Resolution on**  
2 **Reducing Ozone Exposure Misclassification**

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19 Keywords: Bayesian Maximum Entropy; ozone; data fusion; Chemical Transport Model

20 Highlights:

- 21 • A BME framework that integrates ozone observations and CTM model predictions
- 22 • Compared the impact of multiple temporal upscaling methods
- 23 • Finer CTM horizontal resolution can improve BME estimates
- 24 • BME estimates improved estimation accuracy and spatial variability

25 Abstract:

26 We have developed a Bayesian Maximum Entropy (BME) framework that integrates  
27 observations from a surface monitoring network and predictions from a Chemical Transport Model  
28 (CTM) to create improved exposure estimates that can be resolved into any spatial and temporal  
29 resolution. The flexibility of the framework allows for input of data in any choice of time scales and CTM  
30 predictions of any spatial resolution with varying associated degrees of estimation error and cost in  
31 terms of implementation and computation. This study quantifies the impact on exposure estimation  
32 error due to these choices by first comparing estimations errors when BME relied on ozone  
33 concentration data either as an hourly average, the daily maximum 8-hour average (DM8A), or the daily  
34 24-hour average (D24A). Our analysis found that the use of DM8A and D24A data, although less  
35 computationally intensive, reduced estimation error more when compared to the use of hourly data.  
36 This was primarily due to the poorer CTM model performance in the hourly average predicted ozone.  
37 Our second analysis compared spatial variability and estimation errors when BME relied on CTM  
38 predictions with a grid cell resolution of 12x12km<sup>2</sup> versus a coarser resolution of 36x36km<sup>2</sup>. Our analysis  
39 found that integrating the finer grid resolution CTM predictions not only reduced estimation error, but  
40 also increased the spatial variability in daily ozone estimates by 5 times. This improvement was due to

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