The manuscript presents a well-written and comprehensive update to the DERMA model, with substantial improvements to its treatment of turbulent diffusion and puff dispersion. The methodology is carefully explained. Overall, this work represents a significant step forward in the modeling capabilities of DERMA. I have only minor comments and suggestions that the authors may consider addressing to further strengthen the manuscript.

- In line 56, the authors state that DERMA is designed for long-range dispersion modeling and performs better on these scales. However, in line 30, they mention that puff models generally work well when the puffs are young, while additional assumptions and complications arise as the puff evolves. This appears contradictory. The statement on line 30 suggests that puff models are better suited for short-range applications (young puffs), whereas DERMA is tailored for long-range scenarios (more evolved puffs). Could the authors clarify whether DERMA operates fundamentally differently from other puff models in this regard? It would be helpful to explain the specific advantages DERMA offers over other puff models, and to provide justification for implementing a new turbulent diffusion scheme rather than adapting one of the existing models that may already perform better on short spatial scales (e.g., PPM).

- Consider indexing the puffs and particles as j_{part} and j_{puff} for clarity and consistency in code and notation.

- While not essential, a simple cartoon or schematic illustrating the additions to the model would be a helpful visual aid. For example, a diagram showing puff sizes, centroids, and particle behavior under different conditions (e.g., vertical wind shear, puff vs. eddy size) would enhance understanding.

- Line 130-132 and 141: It would be useful to clarify how the ‘good results’ for parameters such as β_{min} and α were determined. Were these values chosen based on statistical analysis of the experiments?

- Line 139 and 145: Does the transition between Gaussian and uniform distributions occur within a single timestep, or is there a gradual change? If the former, could such abrupt transitions introduce temporal inconsistencies when tracking puffs?

- Line 180: Please provide a brief justification for the choice of constant values used here.

- Figure 1: It would improve interpretability to include an example of a concentration field at a specific timestep overlaid on one of the geographic maps. Alternatively, a comparison showing differences in concentration fields between the old and new models for a case with more dramatic changes (e.g., Oeresund experiment) would be instructive.

- Figure 4: To improve readability, consider adding contours or using a higher transparency gradient to help visualise the spread of points in the scatter plots.

- Line 334: The term "fraction" should likely be replaced by "percentage."

- *Section 3:* Do the authors have an explanation for the low percentages of the factor predictions? Especially for the ETEX experiment, where the measurement stations are quite far away and are therefore not so sensitive to small absolute changes. That less than half of the model values lie within 1/5th and 5 times the measured values stands out since other statistics appear reasonable. It would be helpful to double-check these numbers and, if accurate, offer a brief discussion or hypothesis to explain them.

- Several references appear to be missing DOIs.