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Interactive comment on "A quasi-experimental coastal region eddy diffusivity applied in the APUGRID model" *by* Silvana Maldaner et al.

Anonymous Referee #2

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In this work, the authors incorporate new parameterizations of turbulent diffusivities developed for coastal profiles in Brazil into a pollutant diffusion model. The validation data came from an air pollution experiment developed in a coastal area of Denmark. Only unstable conditions are considered. The theme is original and suitable for the journal.

Major comments: 1. Although the original idea of the work is appropriate, the advantage of introducing these profiles in the proposed model is not demonstrated. The authors should first make a brief description of the original way in which there is solved the Eulerian pollutant diffusion equation in the model to understand the advantage of using the profiles developed in Brazil. In addition, the results obtained with the original model and those obtained with the modification of this work should be shown in Figure

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Discussion paper

1, to observe the improvements introduced.

2. On the other hand, in the introduction there is presented both methodological issues and information on the data used. These topics should be incorporated in the data and methodology section. The introduction should be enriched with a detail of the background that indicates the lack of information or of methodological development that leads to the aim of the work. The aim should be written more clearly.

3. It is not clear from the beginning of the methodological description that only unstable conditions will be considered. Authors should make it explicit. Nor is variable C adequately described, since by its units (Fig. 1) I understand that it is a concentration per emission and surface area unit. Is that correct? It is also not known if the pollutant diffused is a gas (which?) or it is particulate matter.

4. The authors should better describe how they chose the Copenhagen experiment cases for the model validation. For example, did they consider ranges of Instabilities? It is measured by which variable? In addition, which were the atmospheric boundary layer characteristics in these cases? Were these characteristics decisive in the choice of cases?

Minor comments: 1.The years in citations and in the bibliography mentioned at lines 44, 50, 55 and 86 are missing. In 26 the correct citation is Panofsky and Dutton (1984). 2. Describe what is S in Eq. 1. 3. In line 43, APUGRID is a model or a numerical method? 4. In Eq. 7, u is a mean or an instantaneous value? 5. In Eq. 8, which is the difference between u ÌĚ y U ÌĚ? 6. Add a citation for Eq. 12. 8. Variables units are missing in Table A1. In addition, variable COR is used in the table and R (line 99) is used in the text. Please, unify nomenclature. I suggest adding in the Table Caption the definition of the variables.

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