

Interactive
Comment

Interactive comment on “The implementation of a MiXed Layer model (MXL, v1.0) for the dynamics of the atmospheric boundary layer in the Modular Earth Submodel System (MESSy)” by R. H. H. Janssen and A. Pozzer

Anonymous Referee #2

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The authors present a new MESSy submodel for a more detailed calculation of boundary layer dynamics and chemistry. The authors show that MXL embedded into a (currently 2-box) column model named VERTICO is a useful tool for analysing measurement campaign data. In the future the model should also be used to develop better parametrisations of BL processes for the global 3D model EMAC.

The paper is well written and contains a lot of detailed information about the model MXL. Therefore I recommend the article for publication after minor revisions as listed below.

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Comments to the content of the paper:

- The information, that MXL is really only the submodel and that in addition a column model named “VERTICO” was developed is given very late in the article. It would be good to mention this also in the introduction.
- Section 2.1: I think it to be very confusing that the subscript “s” in Eq. 1 stands for “surface”, while in Eq. 3 it is used for “subsidence”. It would be better to used different subscripts to avoid this confusion.
- Eq. 11: Please give a short explanation why the approximately equal sign is valid.
- Sect. 2.4: (A) From my perspective it looks like using a sledge hammer to crack a nut to use TNUDGE for a model located at one point. (B) Do you want to use TNUDGE in the BL or the FT box?
- page 7211, line 16: Please explain, why you used 173. The middle of the year would be 182.5, so I could understand 183, but why 173?
- Sect. 3, line 4: What do you mean? Does VERTICO include its own time integration, as it has to define its number of vertical boxes or does it use the generic MESSy submodel TIMER? If not, why? You are taking advantage of the rest of the MESSy infrastructure, why not using TIMER?
- Sect. 3: If I understand correctly, you are describing the processes in the ABL in the required detail. But where is the description of the applied equations and assumptions for the FT box?
- Sect. 3.1, first paragraph: You forgot to mention the diagnostic submodels. List process and diagnostic submodels or use the terminology of “regular” submodels, which is used in other MESSy publications for process and diagnostic submodels all together.

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- Table 1 (and text): You write that you (want to) use TNUDGE, OFFEMIS and ONEMIS. All these submodels depend on data input via the generic submodel IMPORT or you have to provide your data otherwise. As IMPORT is not named in Table 1, I assume that you provide the data otherwise. But you do not provide the information on how you are doing this and what you are prescribing, where you take the emission fluxes and mixing ratios from? On the other hand its looks quite an effort to use IMPORT for a single point.
- Table 1 and text: To my knowledge RAD and SURFACE are very ECHAM specific. How realistic is it to use it for MXL?

Typos and technical corrections:

- page 7201, line 23: “in into” → “into”
- page 7205, line 6: “for the both” → “for both”
- page 7205, line 9: “account” → “accounts”
- page 7211, line 3: “taken at” → “to be”
- page 7211, line 10: “universal time” → “universal time coordinate”
- page 7212, line 4: “taken equal to” → “assumed to be” or “set to 1”
- page 7219, line 4: “is a de facto” → “is de facto a”
- page 7220, line 25: “in the ” → “in”
- page 7222, line 7: “in into” → “into”
- page 7222, line 11: “it possible” → “it is possible”

- Table A1 / A2: why are these tables labeled as Appendix tables?
- Table 1: PTRAC is no process submodel, use regular instead of process or write process and diagnostic.
- Table A1, caption: “as as” → “as”
- Table A1, caption: “have zero initial concentration and zero surface emissions” → “are zero and have no surface emissions”
- caption Fig. 6: “evolution of gas phase chemistry” is very unclear. I had to look at the picture a longer time, to see that each plot is for a different chemical species. Please elaborate the content of the figure in more detail.
- a list of abbreviation in the appendix would be a great help for the reader.

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