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Interactive comment on "GenChem v1.0 – a chemical pre-processing and testing system for atmospheric modelling" *by* David Simpson et al.

Anonymous Referee #1

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General comments

The paper describes the structure and usage of the GenChem system, which provides scripts and input files for converting chemical equations for use in chemical transport models (CTMs). GenChem was primarily developed for the EMEP model but can be run as a stand-alone chemical solver for testing of chemical mechanisms. One of the main advantages of the system, compared to other such as e.g. KPP, is more human-readable results, which are represented by the name e.g. 'HNO3' instead of numeric or abstract variable representation.

The authors emphasize that the GenChem system can be used as a solver enabling testing of different chemical mechanisms. Several mechanism which are in the system are described in the paper. It is not clear if the system includes mechanisms that are

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currently the most popular in chemical transport models. The authors should provide information which mechanisms are the most frequently used in CTMs, recently. Which of these mechanisms are included in GenChem?

The system can be a valuable tool for converting chemical equations to EMEP, which is an open-source model, used by a wider community. It is not clear how about the ESX model. It should be clarified if you can share the code of ESX. Provide the recent applications of this model.

The paper is quite difficult to read, e.g. chapters/subchapters' names are taken from the names of files (e.g. 6.1. GenIn_Shorthands.txt). The names should be more descriptive/should tell what the chapter is about. There are also inconsistencies in use of the models' names, e.g. the same model is called with different names – EMEP MSC-W, EMEP, EMEP CTM, EMEP 3-D CTM, which can make difficult to understand the text for people not familiar with the EMEP model.

Other comments:

- The number of examples of the system application is very limited. The authors often refer to two papers which are in preparation (Bergstrom et al. 2020a and b). I would suggest to add an example of application of e.g. two different chemical mechanisms in EMEP and show the differences in the modelling results.

- In the introduction: include information which are the most popular chemical mechanisms recently used in CTMs and which of these mechanism are in the GenChem system

- Do not use EMEP/ESX system – it should be "EMEP or ESX" or "EMEP and ESX"

- Add information how much time it takes to run the system for different chemical mechanisms and how much time it takes to run the EMEP model with these mechanisms. Precise which of the chemical mechanisms can be used with the EMEP model.

Technical comments

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Line 47 – explain what is TWOSTEP, you have not mentioned it before.

Line 70 - "We believe the EMEP model is among the fastest CTMs"– how do you believe that?

Line 128 – options of what?

Line 146 – "if emissions are wanted" – explain what is the difference in using the model with and without emissions included

Line 215 – correct "in ?"

Line 225 – explain what is remPPM

Line 227 – explain what is NPAS

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