Kerkweg et al. describe in their study the new basemodel DWARF, which is implemented in the MESSy infrastructure. DWARF is a simplified basemodel, which comprises the elementary contents of a basemodel. For example, DWARF defines a model grid, implements a time control (including the possibility of reruns), specifies the type of parallelization and data transfer (MPI) and give the possibility to create and initialize base variables. This makes it possible to perform simplified MESSy model simulations using DWARF as a basemodel instead of more comprehensive and time consuming GCMs such as ECHAM5, COSMO or ICON.

This has advantages for tasks, where the use of the comprehensive legacy base models lead to poor performance and at the same time not all the content of the used base model is required. For example the use of DWARF is for example, as the authors describe, useful in the case of porting of a small set of submodels to a new HPC architectures, for example to a GPU system, or in the case that you want only investigate local processes in a box or in a column.

The authors describe in their paper first the general infrastructure of MESSy and its workflow, also going into more detail on the MESSy submodels that are directly involved in this infrastructure. Then they present the technical realization and the design concept of DWARF and at the end the paper is completed with four application examples using DWARF.

In my opinion, the paper is very interesting and I can highly recommend it for publication. I think it's very good that the general infrastructure of MESSy is described first, and I see this as an added value of the paper, as it really helps to understand how the basemodel DWARF can be combined with MESSy and how it has to be set up. The description of the DWARF basemodel itself and how it works is comprehensively explained and understandable and therefore very useful if you want to use DWARF. I also think that the examples of what can you do with DWARF are sufficient and illustrate very nicely how DWARF can be used effectively.

Therefore I think that the paper is of great scientific importance and significance. Moreover it is written clearly and has a reasonable and understandable structure, language and figures. In my opinion the paper is already in an almost finished state. The paper complies with GMD guidelines and is fully suitable for publication in this journal.

Remarks/Suggestions:

A general comment from me concerns the abstract. I think it has partly more the form of an introduction. It refers very strongly to MESSy and in my eyes to less to DWARF itself. It should be underlined what advantages there are to use this new DWARF basemodel and to make the reader more curious to read the paper.

Specifically, I would shorten the description of MESSy in the abstract, make the description of DWARF more detailed, indicate which examples are discussed in the paper, and do a bit more advertising for the DWARF tool as a new useful and good application.

In total the paper is already in very good condition. I personally have found very few mistakes:

Line 8: “Since” → “For”

Line 80: “asf”. Personally, I wouldn't use the abbreviation etc. as it's not necessarily familiar, but maybe I'm wrong.

Lines 95: “… set of prognostic variables …” → “… first set of prognostic variables …” ?

Line 120: Would you also consider nudging data as boundary data? If not, I would also mention it here.

Line 151: “… the prognostic variables.” → “… the corresponding prognostic variables.”

Line 211: “,as no basemodel is providing any data,” → “as no data is provided to DWARF from another base model,”

Line 231: “Figure 5” → “Fig. 5”

Table 3: In Orbit1 and Orbit2 you have mgpcol=83 and dlat=2, with a start point of -70°N the last grid box would be at -70+(83*2)=96, that means at 96°N … Is that intentional?

Fig.7: “0°E, 60°S” →”0°E, 40°S” (red solid line)

Line 281: “Figure 7” → “Fig. 7”

Fig.8: “… 10 minutes after model start.” → “10 minutes after model start (1.6.1998).”

Line 300: “… to the defined grid.” → “… to the defined grid (from 30°N to 51.5°N and 15°W to 16.5°E).”

Line 302: “Figure 8” → “Fig. 8”

Line 305: “profiles” → “fields” ?

Line 306: “… these profiles …” → “… these temperature, pressure and humidity fields …”. For better clarification (only a suggestion) …

Fig. 9: 1) “Profiles at three …” → “Ozone profiles at three …”
2) “… at model start (left) …” → “… at model start (0 UTC, 1.6.1998, left)”

Fig. 9 (panel top left): “O_3 initial profile” → “O_3 initial profile (0 UTC)”

Fig. 9 (panel top right): Is this really the difference between init – 12 UTC, or vice versa? I would rather expect the latter.

Line 317: “of O^1D” → “of O^1D (O_3 + hv → $O(^1D)$ + O_2)

Line 352ff: I would suggest (but it´s only a suggestion): “The higher the photolysis frequencies are, the faster ozone decrease ($J(O^1D)$), OH increase ($O(^1D) + H_2O \rightarrow 2OH$), H_2O_2 increase ($2HO_2 \rightarrow H_2O_2 + O_2$), methane decrease ($CH_4$ + O(1D)), and HNO_3 increase ($NO_2 + OH \rightarrow HNO_3$).”

Fig.11./Tab.5: There is something wrong. Corresponding to the panels in Fig.11 in the redline case OH is emitted at 12 UTC, and NO at 14 UTC, and in the blackline case OH at 14 UTC and NO at 12 UTC. But in Tab.5 and in the legend of Fig. 11 the corresponding times are reversed.

Line 367: “HNO_3 can only be build, …” → “HNO_3 can only be build ($NO_2 + OH \rightarrow HNO_3$),…”

Line 381: “even better performance (greater speedup) on GPU” → “even better speedup on GPU”. In my opinion MOM shows a better speedup, but not a better performance (because MIM is still faster).

Line 386: “Tab. 6^6 “. I find this 6 as exponent from 6 confusing. Maybe you can change that somehow.

Line 401: “https://www.nat-esm.de/” → https://www.nat-esm.de

Line 410: “… is already in use …” →”… is also used …”

Line 422: “https://dlr-amr.github.io/t8code/ “ → “https://dlr-amr.github.io/t8code “