

Interactive comment on “Overview of the Meso-NH model version 5.4 and its applications” by Christine Lac et al.

Christine Lac et al.

christine.lac@meteo.fr

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Answer to Reviewer 1 : gmd-2017-297-RC1

We thank Referee 1 for his/her comments. We answered below to all the points. Changes made to the original version of the paper appear in track-change mode on the enclosed pdf.

Ref 1:

Due to the large number of schemes and their dependencies, I would suggest that the authors could add a table (or a figure) summarizing the available options (scheme's name + main reference or section) for a process and the links between the schemes (it could replace or augment Table 4, which I think is not meaningful enough). for

example (as I understood the links), microphysics → ICE3 (single-moment) → ICE4 (hail) → CELLS (electricity and lightning) / or LIMA (double-moment) and if there are retroactions (coupling) surface → SURFEX ↔ water ↔ NEMO ↔ sea salt emissions / or CROCO for example, some additional links could be clarified.

Authors: We agree that additional information is necessary to clarify the links between the schemes. Table 4 was previously asked by the Editor, it has been completed with some information about the schemes and their links. Also, a new figure (Fig.6) has been added to show the one-way or two-way links between the schemes.

Ref 1: As stated in Table 4, there is some atmospheric chemistry research regarding electricity. I understand it is one-way coupling but it is not mentioned elsewhere.

Authors: You are right, a sentence has been added in Part 4.7: A lightning-produced NO_x (LNO_x) parameterization is implemented in the electrical scheme. Since the CELLS scheme reproduces the lightning flash path, the LNO_x production is taken proportional to the lightning flash length and depends on the atmospheric pressure (Barthe et al., 2007).

Ref 1 Specific comments: 3.4 numerical diffusion | p.9, l.6. precise if it is CEN4TH.

Authors: Yes, it is.

Ref 1: 3.6 Initial and boundary conditions | p.11, l.25: ceiling : are there some considerations to use above conditions from the LS grid instead of using an absorbing layer ?

Authors: The absorbing layer uses LS fields to relax prognostic variables towards them.

Ref 1: 4.1 surface | p.12, l.12: refer to section 7 for the use of the interface.

Authors: The introduction of section 7 has been clarified as the coupling interface in SURFEX exists for all the schemes, and has allowed the coupling with 3D ocean

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models.

Ref 1: p.13, l.9: you could name it slab instead of big leaf, which is commonly used for this type of model

Authors: All right, done.

Ref 1: p.13, l.16- l.18: this sentence could be rewritten ...the TEB scheme approximates the real city 3D structure by resuming this landscape in the form of an urban canyon. ...

Authors: Thank you

Ref 1: p.13, l.21: 'due to the larger surface in contact with the atmosphere' : please add: ... and to the city materials with large heat capacities...

Authors: Thank you

Ref 1: p.13, l.27: Is ice only considered over inland water ? Are glaciers considered as part of land surface processes with ISBA ? What about sea ice ?

Authors: Permanent snow is treated in the ISBA scheme as very deep snow. Sea ice is treated either where SST temperature is below -4°C or by the s GELATO ea ice model (Mélia, 2002) coupled with the 3D ocean model. These elements have been added.

Ref 1: p.13, l.29: is it through a simple aerodynamic roughness length parametrization ?

Authors: No, the fluxes are directly simulated, using a statistical fit coming from various experimental campaigns (Belamari and Pirani, 2007). This reference has been added in the text. Belamari, S. and Pirani, A.: Validation of the optimal heat and momentum fluxes using the ORCA-LIM global ocean-ice model, MERSEA IP Deliverable, D.4.1.3, 88 pp., 2007.

Ref 1: p.14, l.1: how was the 300-m urban local climate zones database created ?

Authors: The urban LCZ were derived from the global human Settlement Layer produced by JRC: Pesaresi M., Guo H., Blaes X., Ehrlich D., Ferri S., Gueguen L., Halkia M., Kauffmann M., Kemper T., Lu L., Marin-Herrera M.A., Ouzounis G.K., Scavazon M., Soille P., Syrris V. and L. Zanchetta A Global Human Settlement Layer From Optical HR/VHR RS Data: Concept and First Results. IEEE J. Sel. Top. Appl. Earth Obs. Remote Sens. 6(5):2102–2131, 2013. doi:10.1109/JSTARS.2013.2271445.

Ref 1: 4.2 turbulence | Some clarifications needed. Is it the user who specifies T1D or T3D? Or is it depending on the grid spacing (T3D below grid spacings of 2 km) ? Is it the user who specifies mesoscale or LES ? Or is it depending on the grid spacing (LES automatic below grid spacings of 500 m) ? Are there clear recommendations from Meso-NH community experience or is it still an area of investigation ?

Authors: T1D or T3D, determining mesoscale or LES mode, and the mixing length parametrization are chosen by the user according to clear recommendations given above. This remark has been added.

Ref 1: 4.3 convection and dry thermals | please clarify. -p16, l. 13: The first statement is confusing it should be clarified. It says that shallow and deep convective clouds parametrization is needed for grid spacings larger than 5 km, but latter in the text it is stated that shallow convection with PMMC09 improves clouds up to 500 m- 1 km. So the authors recommend it for small grid spacings ? -p.16, l. 28 : the name PMMC09 is provided too late in the section.

Authors: Clarification has been brought.

Ref 1: -p.17, l. 4: are those modifications to the grey zone already some options available for the users or is it still under investigation ?

Authors: These options are available in version 5.4, but the question is still under investigation.

Ref 1: 4.7 electricity | p. 21, l. 22 / ICE4 is not mentioned in the microphysics section

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4.4. Is it an extension developed only for electricity ? If not, it should be presented in section 4.4. As this component do not appear in figure 2, it could be a sub-section of the microphysics section.

Authors: Thank you, the introduction of ICE4 in the microphysics was missing, as ICE4 does not exist only for electricity. This has been also clarified at different locations, including the microphysics figure caption.

Ref 1: 5.1 emissions and dry deposition | p. 23, l. 18 / mention that a more detailed presentation of coupling over water is provided in section 7.1

Authors: Yes, thank you.

Ref 1: 7.5 Chemistry and aerosols | p.37, l.8-9: “The SO₂ concentration modelled for the plume is close to the observations”. I believe the authors, but it is hard to see it in figure 14, we don't see rings colours for the aircraft location (or is it because the colours are the same than the background?)

Authors: You are right that it is hard to see it in Fig.14. A few sentences have been deleted.

Ref 1: 10 outlook | p.43, 27: the sentence “in the near future...” would better be in section 9

Authors: You are completely right, thank you.

Ref 1: Technical corrections: table 4 / Turbulence: weather process studies; and Electricity: weather AND process studies ? Authors: Thank you, it has been corrected.

Ref 1: References Barthe et al. 2012A and 2012b are the same Authors: Thank you, it has been corrected.

Ref 1: 7.2.1 urban studies p/32, l.16: replacing building by developing is preferred for this section Authors: Yes, done.

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Ref 1: p.42, l.23 and p.43, l.1 : repetition of regarding, please change one of the sentences. Authors: Yes, done.

Thank you very much for the time you have put into the correction of this paper and the relevance of your remarks.

Please also note the supplement to this comment:

<https://www.geosci-model-dev-discuss.net/gmd-2017-297/gmd-2017-297-AC1-supplement.pdf>

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2017-297>, 2018.

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