

# ***Interactive comment on “The multiscale Routing Model mRM v1.0: simple river routing at resolutions from 1 to 50 km” by Stephan Thober et al.***

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## 1 General comments

This paper presents a model for simulating river discharge across a range of resolutions. This will likely be a very useful tool for a range of applications and its high degree of flexibility is a particular strong point. I generally find the model to be well presented and the validation provided on two different datasets to be thorough. The quality of the figures given is good and the quality of the writing generally high though there a few notable lapses (see technical corrections for those I have noticed).

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My only concern is a lack of discussion of the upscaling of river directions themselves; particularly to the coarser scales. Upscaling D8 river directions can produce errors in routing that leads to water entering the wrong catchment. Did the authors encounter such problems? Would they expect to encounter them for river systems outside Europe? Were other upscaling algorithms (e.g. Yamazaki et al. 2009 “Deriving a global river network map and its sub-grid topographic characteristics from a fine-resolution flow direction map”) considered at any point? Even if uncommon such routing errors would have a major impact on model performance so are worthy of some consideration/discussion.

## 2 Specific comments

Page 3 Line 2 – Minimization of computational demands is mentioned here but unless I missed it no indication of the actual computational demand of this scheme is mentioned here. Ballpark figures for a one or two resolutions and grid sizes would be useful for comparison purposes – how long does a simulation of X timestep/days/years take on machine Y? Is parallelisation possible?

Page 4 Line 7 – What does “center grid” mean here? Is this supposed to mean “grid center”?

Page 9 Line 19 – “exhibits limited impact to change of epsilon and gamma.” – I am not quite sure what is meant here. Please review this sentence

Page 15 Line 31 – This sentence isn’t clear. I assume it is meant that the model can also handle rotated grid as well as regular latitude longitude grids. Please clarify. Also, how about other grid e.g. a triangular grid?

Page 18 Line 7 – “It also avoids further computational demand by scaling the generated runoff etc. etc.”. I wasn’t clear what was meant by this sentence. Please clarify.

## 3 Technical corrections

Page 5 Line 9 – “the equation 5” -> “equation 5”

Page 5 Line 9 – Incomplete sentence “the sufficiently high model performance” -> “the sufficiently high model performance that it gives.”

Page 5 Line 11 – I suggest “but it is not as available as...” -> “but it is not as readily available as...”

Page 6 Line 6 – “dividers” -> “divisions”

Page 7 Line 13 – “along -> “on”

Page 8 Line 6 – “daily resolution NetCDF files” -> “daily resolution in NetCDF files”

Page 9 Line 9 – “which was obtained” -> “which were obtained”?

Page 9 Line 13 – Invalid grammatical construction “because they allow to investigate” -> I suggest to replace it with “because they allow us to investigate”

Page 11 Line 23 – “aTS allows to use different” -> “aTS allows us to use different”

Page 12 Line 2 – “very little standard deviations” -> “very low standard deviations”

Page 12 Line 9 – “which generates the little mismatch” -> “which generates the small mismatch”

Page 13 Figure 5 Caption – “light gray violins”, “dark gray violins”. I see only red and blue violins. It seems the color scheme has been updated without updating the caption. Please update this caption.

Page 13 Figure 5 Caption – “and have scaled to the same widths” -> “and are scaled to the same widths”

Page 15 Line 12 – “The aTS parameterization allows to simultaneously” -> “The aTS parameterization allows us to simultaneously”

Page 15 Line 18 – “still little” -> “still small”

Page 15 Line 18 – “that has the hydrological model used as input to the routing

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scheme.” -> “that the hydrological model used as input to the routing scheme has.”

Page 17 Line 12 – “very little” -> “very low”

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Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-13>, 2019.

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