EGUsphere, referee comment RC3
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Comment on egusphere-2022-690

Anonymous Referee #3

Referee comment on "Hydrological modelling on atmospheric grids: using graphs of sub-grid elements to transport energy and water" by Jan Polcher et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-690-RC3, 2022

In this manuscript, the authors proposed a new tiling method to efficiently incorporate high-resolution topographic information for better hydrological simulations by atmospheric models while keeping the atmospheric grids. First, they built hydrological coherent units (HTUs) from hydrological digital elevation models. Then, by evaluating the generated river networks and sensitivity experiment results, the authors proposed a way to find appropriate truncation numbers for HTUs and time steps. Finally, they conducted offline ORCHIDEE simulations and compared the simulated discharge and river temperature with observations.

The manuscript is well-written and contains valuable information for ESM modelers. Therefore, I recommend publication after minor modifications.

General comments:
1. Can you explain more about the connectivity between atmospheric grids? For example, how do you maintain consistency when an HDEM grid overlaps with multiple atmospheric grids and is split into multiple supermeshes?

2. It would be helpful to add a figure to compare the results with the previous ORCHIDEE simulations explained in Section 6. Have you observed any improvements by taking into account the detailed topography information?

Specific comments:
L97: Can the atmospheric grid be divided into vegetation tiles? If so, how can vegetation tiles be related to HTUs?

L107: It may be helpful to add an explanation of how the lambda was derived.

L182: Eastern -> Western? Could you include a compass symbol to indicate the direction in Figure 2?

L185: Are any panels showing the results of the first step in Figure 2?

L193: It is unclear to me which location you are referring to; it would be helpful if Figure 2a includes the names of the local rivers.

Figure 8: four different grids -> three different grids?