

R3_0

Multiplicative random cascades is not within my field of research and I cannot therefore not perform a qualified review of this part. I will therefore leave it to the other two reviewers to detail herein. I have, however, worked quite a bit with climate projection of rainfall and downscaling issues related to urban hydrology where continuous rain series are required to simulate long term hydrological performance (see e.g., Thorndahl and Andersen (2021). Especially cases like the green roofs where the performance indeed depend on the antecedent conditions are interesting to investigate under future climate conditions.

The paper is generally well written but more details at the conceptual level could help the overall understanding of the proposed procedure.

Thank you for your comments. We will intend to take them into account in order to further improve the current manuscript.

R3_1

I suggest describing more in detail the observational outflow data from the green roofs, the physical details of the green roofs, description of dominant processes of the roofs (e.g., in the introduction and not only in the method section), etc.

The current introduction includes:

- the hydrological performance of green infrastructure and input data needed for modelling.
- available observed data in Norway and France.
- types of downscaling
- popular temporal downscaling methods.

With respect to this comment (R3_1) and R1_1 we will add a paragraph about green infrastructure and green roofs. With respect to R1_16 we will detail the different behaviour of the green roofs used in this study in terms of dominant process (i.e., the extensive green roof and the detention based extensive green roof).

R3_2

Table 3 shows the differences in retention fraction between observed and projected conditions. It could be interesting to see a similar table with observed values versus modelled performance for the current climate conditions in different MRC modes. Unlike fig 5 and 6, which are difficult to interpret, a table summarizing the performances would clarify this part.

The table 3 do not include the different MRC mode in the current system because they would lead to similar performance since retention is often not affected by the downscaling (because of the characteristic time for evapotranspiration). We believe that the indicator for green infrastructure performance must include information on climate variation which lead to performance variation. In our case, due to the different climates investigated and the number of MRC modes, a large amount of information has to be displayed which does not make it suitable for a table in text.

We will further clarify those figures (5 and 6) according to answers to reviewer 1 and 2. In the light of your comments, we will intend to select an indicator summarizing the performance such as a statistical distance between discharge distribution based on observed and downscaled timeseries. and add it to table 3.

R3_3

Is it possible to summarize the change of climate in some specific parameters, e.g., changes in annual and seasonal precipitation, change in consecutive dry days, temperature, etc. for the different locations? This would

help understand the differences between locations and maybe lead to an interpretation of the most important processes for the green roof performance and how the processes change under a change in e.g., temperature, rainfall patterns, etc.

It would indeed be interesting to clarify the input data for different location and climate period. The data about input are currently detailed in Table 1 The Köppen Geiger classification gives some information on the properties of the climate but we agree that relevant indicators in terms of hydrological performance would be more interesting to share. This table will be extended with some indicators to include shift in climate and represent difference between locations.