# Reply to Mattia Neri

We would like to thank Mattia Neri for his very relevant comments on the manuscript. We provide an answer to each of his comments hereafter.

Comment:

*Lines 201-204: Please double check the description, "...either a remaining PET component is used to calculate evapotranspiration withdrawn (blue arrow) from the production store (green rectangle) or..." but blue arrow (evaporation) consistently withdraws from the interception storage and green arrow (transpiration) withdraws from root zone/production storage, right?*

Reply:

The reviewer is right: there is an inconsistency between the text and the figure. The GR4J model's storages and fluxes are conceptual representations of hydrological processes. Here, the remaining PET energy demand after the interception process corresponds to both transpiration and evaporation processes. Therefore, we will add a blue arrow exiting the production store of GR4J on Fig. 1 and change the related explanations by the following sentence at lines 201/202: "Then, either a remaining PET component is used to calculate evapotranspiration withdrawn (blue and green arrows) from the production store (green rectangle) …".

Comment:

*Lines 312-316:  I think that TUWmodel elevation zones can be set by the user as de-sired, even using different ranges if needed (if inputs and drainage areas are defined accordingly). Moreover, I would specify that, in contrast to CemaNeige, model parameters could be differentiated across elevation zones.*

Reply:

Thank you for this comment. Indeed, `TUWmodel` enables to set the elevation zones with different ranges if needed. We will replace the explanations at lines 312-319 by: "The spatial distribution of snow processes by the `TUWmodel` and `sacsmaR` packages follow another principle, the difference being that the elevation zones can be set with different ranges and with different surface areas (e.g. Fig. 2). Model parameters can be differentiated across elevation zones". We will also correct Fig. 2 (see Fig. 2 on page 2 of this document).
As stated lines 344-346: "The HBV model of `TUWmodel` enables a very straightforward spatial configuration where the model is run independently on different zones (with different parameters and inputs), which can be subbasins, elevation zones or any area defined by the user", the parameters of `TUWmodel` can be differentiated across elevation zones. We will add this explanation in the section related to the spatial discretization of snow modules (section 3..2.1).
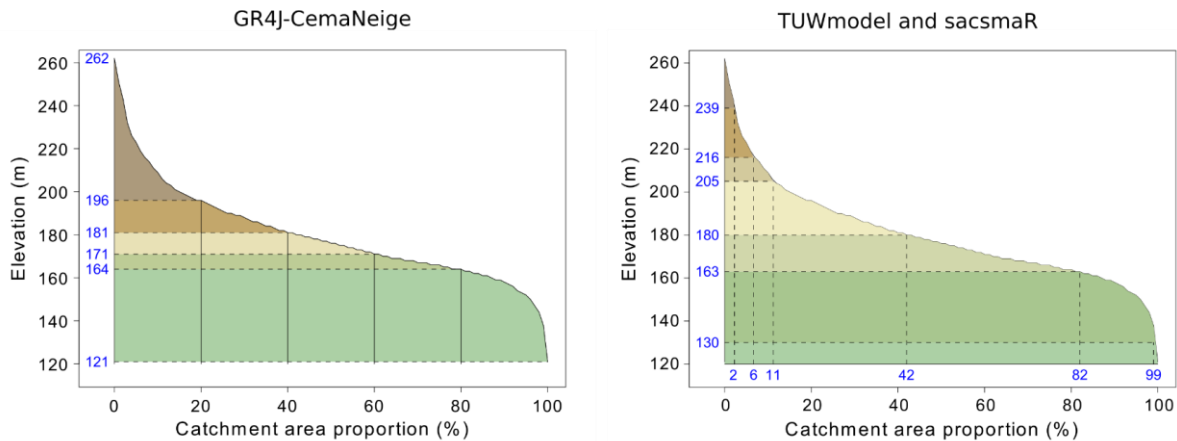
**Figure 2.** GR4J-CemaNeige elevation zones (left) and TUWmodel/sacsmaR elevation zones (right) both following the hypsometric curve of the Couetron River at Souday (France). Each colour indicates a different elevation zone.

Comment:

*Table 4: I think that TUWmodel requires also subbasin areas.*

Reply:

Thank you for this comment. TUWmodel indeed requires subbasin areas when used in a semi-distributed mode. We will add this information in Table 4.

Comment:

*Section 4: The authors analyse several package functionalities, as the presence of an automatic calibration function for the hydrological models. However, for the packages which do not include calibration functions (but, in general, for all packages if the user wants to implement a different calibration procedure) is there any advice on the suggested parameter ranges or any kind of related information? I would add such specific information along with the calibration functionalities: it is indeed helpful to the user for the implementation of the models.*

Reply:

We have provided several references (see section 2.2 and Table 1 and 2) that could help users to find possible ranges of parameters for different modelling applications. However, we think that it is not within the scope of this Technical note to provide guidelines on the most appropriate range of parameters for a given model. Indeed, these recommendations would depend on the modelling objectives, the chosen strategy for parameter estimation and several other modelling aspects.

Comment:

*Lines 434-438: please clarify, e.g. what do you mean with "combination of criteria" for preprocessing?*

Reply:

Thank you for this comment. The combination of criteria is not related to preprocessing of input data but to the calculation of performance (or error) criteria. We acknowledge that the current

version of the text might be confusing and we will slightly modify it to make it clearer. In addition, we believe that adding sub-headers to section 4.1.1 will increase the readability of this part. A combination of several criteria can be, for instance, a weighted sum of three criteria. For example, in `airGR`, users can average the KGE calculated on discharge, the KGE calculated on square root discharge and the KGE calculated on the inverse of discharge, and different weights can be chosen for each of these three individual criteria.