This study provides a new flexible irrigation and crop scheme, in which several parameters of irrigation and crop phenology could be modified by users. This is very important for detecting irrigation-induced impacts as it considers the spatial heterogeneity of agricultural activities. For the main idea of study, I have no further comments, but I still have some minor comments on the structure, language and some contents. I strongly recommend the authors to polish the full text, as there are some repititions, unclarity and even grammar errors.

The number of lines is based on gmd-2021-332-ATC1.pdf

L50: after 'Affect non-irrigated areas' cite de Vrese paper: Asian irrigation, African rain: Remote impacts of irrigation

L71: after 'vegetation density' (add some citations here)

L74: 'there is' to 'there are'

L76: cite Jägermeyr paper 'Water savings potentials of irrigation systems: global simulation of processes and linkages'

L76: 'The type of irrigation is recognized to' to 'Different irrigation types vary in'

L85: 'follow' to 'reproduce'

L92: I would put the SURFEX and ISBA part to model description in Section2. Here you should briefly describe your objective, and the new features of the new irrigation scheme and what it could be used for.

L101: Also here the simulation part should be in simulations protocol.

L113: 'model run' to 'simulation'

Sec 2: General comments: Section2.1 is called Model implementation and evaluation, actually you talk about study area and simulation settings. I would rename it experimental design or something else, then move it between the description of your new irrigation scheme and data.

L123: I won't say implementation is made over this region, you could say the simulations and evaluation are conducted over this region.

L128: 'irrigation' to 'irrigation activities'

L130: You don't need to specify the forcing data here, as you should do it in Data. Here you can just say meteorological forcing data.

L138: 'nature types'? Aren't they crop types?

L146: Specify the reason why you only choose the area with more than 50%. I guess it is because this is off-line simulation, so there will be no non-local effects, right?

L159: give the formulas of Pearson's correlation and RMSD.

L219: 'In ISBA_ref simulations' Here I would avoid mentioning simulations, instead, I would say 'In the original crop scheme of the ISBA model'. Other information regarding the simulations could be moved to section experimental design mentioned in the general comments

L237: What do you mean 'based on', or you just want to express that you used SURFEX v8.1 to do the simulations?

Section 2.3: General comments:

It is very hard to compare your new scheme and the old scheme, as the old scheme is not presented in paper at all. I would add a brief description of the old scheme, including how irrigation is triggered and where the water is applied. I would split this section to two subsections: the original crop and irrigation scheme and the new one, which would be more clear for readers.

L261: How the values of these parameters are decided? By observation or by calibration. Please specify.

L272: 'it is determined that' to 'The model determines …'

L275: use 'First, Second, …' or 'Firstly, Secondly, …'; 'it is checked that' to 'the model checks'

L280-284: I would just say that the model provides the options to …

L298: top layers? I would say total soil layers in root zone (if I understand correctly).

L301: Could you please specify the reason why this threshold decreases for new seasons?

L311: I would say 'the irrigation water can be intercepted by vegetation canopy.'

L448: why did you choose these two weather stations, one in irrigated land and one in rainfed irrigated land? Is it on purpose or just based on the availability?

L493: the first paragraph is unnecessary.

L512: I think taking no water availability into account could explain the slight overestimation.

L516: 'While … is realistic.' I don't think I understand this sentence. Satellite Lai observations are not realistic?

L557: Based on my understanding, you want to say that surrounded rainfed vegetation affects the phenology? It is better to specify it.

L561: 'Positive …' I would move it to the caption of the figure.

L646: I am wondering if it is possible to add more parameters related to phenology, like the growing period, peak dates, ect… I think this could be a good way of further improving the model performance.

L656: I would describe the poor representation of the cold season processes in ISBA and clarify why it could be the reason.

L685: What are the impacts of irrigation on atmospheric model simulations. I would go deeper how it may limit your study.

Sec.5: You didn't really describe what this study really implies. I would talk more about the advantage of the new irrigation scheme and for what it could be used, and some implications of this study. Example1. This flexible crop and irrigation scheme could take the spatial heterogeneity of irrigation activities into account, thus it is a better tool to detect irrigation-induced impacts on earth system. Example2. Results show that phenology parameters could modify the seasonal pattern of LAI and other variables, and irrigation could affect the magnitude of the variables. This could provide the information for further development.

Sup: Check the tense consistency you used in manuscript and supplements. Both present or past tense are ok but keep it consistent.