We very much thank the reviewer for their comments and suggestions. We found that their comments were thoughtful and helpful to improving our manuscript.

I enjoyed reading this manuscript. The manuscript argues for the use of open science practices in hydrology and does this admirably in a very structured and transparent way. This makes for a helpful document, as are reference for practitioners but also for teaching purpose. It should facilitate discussions surrounding open science both in hydrology but also in other fields (where similar issues exist).

The manuscript is structured along four principles, addressing various stages of research and their potential to be more open. Although there is overlap between them I think this approach works well to address some of the discussions surrounding open science. Further "scenarios" as listed at the end of the manuscript help put some of these principles in context.

As such I'm willing to accept the manuscript as is, as most comments are minor and deal with very nuanced language. Comments listed below should be considered if possible.

General comments:

R2.1: When looking at the larger picture, it might be very important to note somewhere that open access is not a technical challenge anymore but mostly a socio-cultural one. When looking at table A1 and the challenges discussed only 3 out of 13 are technological, while the remaining are mostly political / socio-cultural. Despite the tools listed in the manuscript, I fear open science practices are not governed by the lack of these tools, the access to them (most of them are free), or even the use of them by some.

Response: We thank the reviewer for this observation. We agree that most challenges are not technical in nature. With this paper we want to contribute to removing the sentiment that open science is a technical problem by exemplifying many tools and resources via the practical guide in Section 2. Furthermore, we provide suggestions on how individual scientists can work on removing the remaining challenges. Hopefully we can contribute to overcoming some of the socio-cultural challenges listed. To this end we have added the following to the appendix discussion: “Note that only three out of thirteen challenges are of a technical nature. This shows that the adoption of Open Science is (no longer) a primarily technical challenge.”
Detailed comments:

**R2.2:** [Line 83] "Open hydrologists intentionally plan for, describe, and share the entire research process and approach from motivation to the final product"

I would be careful about leaning too strongly on either defining output as products or the fact that a pre-defined motivation should be provided in order to keep things open. From a very practical point of view dealing with science output as products is often very efficient, as it sets clear expectations. However, language matters and managerial language creep is sometimes very toxic as it often debases research (favouring short term returns, products, over slow generation of bodies of knowledge). I would suggest to shy away from defining research as products, and use research outputs / research results instead.

Response: We fully agree that thinking of research as products is counter-productive, and may be one of the contributing factors to non open source research being the norm. We will rephrase this principle from “product” to “output” throughout the manuscript as well as in the figure and the tables.

**R2.3:** [Line 96] I think asking for a reasonable explanation of methods is ok. However, more often than not the answer might come down to a lack of funding. I wonder to what extent such a motivation will be accepted in review, and if this will stigmatize those who have less resources if there is the expectation that you are really explicit about these methodological choices (limited by funding). This dynamic already exists, but at least the expectation doesn’t exist that it is written in full.

Response: We thank the reviewer for pointing this out. However, we believe that making science open is not an activity that comes on top or after "science has been done", but should be an intrinsic part of the scientific method. This is why we advocate for following the open science approach from the start and throughout the process or to incorporate open science in the stage of research one is currently in (even post-publication). This way, promises in terms of quantity of results per amount of funding may need to be scaled down in favour of improved quality of results, i.e. more reproducible results.

In Line 96, we will clarify that this should be done as is possible.

Further, we will clarify this in the Summary and Outlook, on Line 245, as such:

"Many funding agencies, publishers, and hydrologic organizations are increasingly requiring hydrologists to adopt open science practices, but not all are aware of the additional effort and time needed, as open science practices need to be implemented throughout the process from the project design and budget generation to the final publication and post-publication curation of data."

**R2.4:** [Line 135] Requirements for version control shouldn’t be grounded in the ability to peruse through previous in silico experiments. It is a tall order to ask people to use version control in the first place, it is another barrier to do this consistently in the way of a lab notebook. I heavily use git and to be honest my commits aren't clean. It is important that people save the state of the software used in particular experiments (either through a release/checkpoint on zenodo, github or similar). Actual commits or even branches probably have less value, and make things difficult if not less transparent. i.e. I would stress the deposition of code in repositories, rather than front loading additional computational skills (which are for some hard to acquire - saving data/code in a repo isn't). In general, I will take dirty code over no code and a static release tied to a manuscript over a dynamic repo (with recent changes).

Response: We fully agree that ensuring the exact version of an experiment used for a
publication is available is more important than tracking all intermediate versions. We found that without consistently using version tracking it becomes almost impossible to track exactly what version of the software was used for what experiment. Deposition of code in repositories is mentioned in Principle 4 as well, but we agree some additional emphasis will be helpful. We will add the following sentence to address this aspect:

Following Line 135, we will add the following: “Even more important than version tracking is depositing the code used for each publication in a repository such as zenodo for safe keeping, and this is explained in Principle 4”.

R2.5: [Line 159] This section focusses on software documentation, mostly for the end user. However, true open development is often hampered by not only the lack of user end documentation but proper code comments in the software itself. The lack of clear documentation of the code functioning (not the code use) by inline comments is something that is often forgotten and limits code re-use within different contexts. It also limits learning opportunities by seeing how computational problems are solved within a real world situation, not a classroom setting. A line on this could go a long way.

Response: Thank you for this observation. We agree that comments in the software itself are very important. We will add some clarifications in the text that documentation should also be for developers, not only users. We will add additional text on the importance of inline and developer documentation of code.

R2.6: [Line 160] Include a link to ReadTheDocs, people might not be familiar

Response: With the many technical terms used in the section we fear that addings links to all would clutter the paper too much. But we agree that some of the less common ones could use a link rather than letting the reader search the Internet for the term. We will be incorporating links in our new table, as suggested by the first reviewer within each section of the summary table that includes tips, tools, and resources that complement the practical guide.

R2.7: [Line 179 (and the section below)] I would suggest an open license. Permissive is the perogative of the researcher. It must be acknowledged that permissive licenses, on open software and data, in the past have been abused by industry by offloading tasks to OSS volunteers while not giving back proportionally to the gains made (e.g. recent more restrictive licensing on the openstreetmap data) and this risk is to be assessed by researchers. I think this is echoed by some other reviewers as well. However, the spirit of open science would suggest a permissive license and I value the sentiment.

Response: This is a good point, and we agree with the reviewer that it is a philosophical question what open license best represents the interests of the stakeholders. We will replace “permissive” by “open” in the text as suggested, while keeping the qualification “that allows editing and sharing derivative works with both scientists and the general public” as it was.