I will now address the necessary or highly desirable changes as proposed by you.

Language/grammar.
"Shorter and simpler sentences would improve readability and clarity. I urge you to work with a good copy editor once you have your final draft to submit. Please remember that, in much academic publication, language and clarity are greater determinants of being cited than are novelty and strength of content."

I agree that both readability and clarity could benefit from a good copy editor, necessary actions with respect to professional proofreading are foreseen in case of final draft submission.

Objectives.
"It seems to me that you have two sets of objectives:

1. Objectives of your article, in relation to the potential reader.
2. Objectives of your simulation, for users (students, et al).

Keep these two sets separate. A potential reader needs to know very early on (in the abstract and the intro) if the article is of potential interest. If the article objectives are not clear, you will lose the reader. Here are two suggested sentences: *The main objective of this article is to present a pedagogical tool that takes the form of an interactive simulation for use in university courses on climate change. The purpose of the simulation is twofold: (1) to help students understand the sensitivity of the climate system, especially in regard to GHG emissions, and (2) to provide students with insight into the long-term consequences of global warming.*"

This is probably by far the most crucial mission in the revision of my manuscript, given the basic considerations in the above presented background thoughts about my article. I have (re)formulated the different objectives accordingly in a concise manner (in line with your two suggested sentences) as follows:

The main objective of this article is to present a simulation model that may be integrated in a pedagogical tool for use in university courses on climate change. The purpose of the simulation is twofold: (1) to help students understand the sensitivity of the climate system, especially in regard to GHG emissions, and (2) to provide students with insight into the long-term consequences of global warming.

Having done so in the Intro, Section 2 ('Setting the stage') will be rewritten in a manner that the contents of the subsequent sections 3 to 6 will more logically 'fall in its place' with respect to the above formulated objectives and readers' expectations. Furthermore, where relevant, the introductory text to the different sections will be reformulated or, if necessary, extended to provide additional guidance to maintain the 'bird's eye view' with respect to Section 2.

Article objectives.
"I found it difficult to figure out what objectives you have for the article. Early on you talk about your simulation and its purpose of helping students understand CC. However, later, in Section 3, you go on to talk about the workings and adequacy of various climate models, without (I think) clearly showing how the intricate nature of these climate models and what seems to be your suggested model fit into your simulation for students. In my view Section 3 belongs in a journal on climate modelling."

Section 3 in fact focuses on the cryosphere contribution to the multi-scale simulation set-up, the principle objective of my study. It does so by analyzing available paleoclimatic observations from a climate-sensitivity and feedback perspective. Thus, it provides the necessary link between a possible long-term (cryosphere) contribution and contemporary complex (coupled atmosphere-ocean) climate models. As described above, this should be made more clear to the reader by rewriting the introductory text in relation to the 'Big picture' laid down in Section 2.

"I may be missing something, but I also found it hard to understand how your Sections 4 and 5 relate to your simulation? Section 4 is titled "simulation set-up", which made me expect to see aspects of the practical working of your simulation in the classroom, such as, starting the simulation, interface configuration, student interaction with the simulation, etc. However, I then encountered more discussion about the climate system, and not about your simulation, how it is used, and what results you have obtained in using it. Section 6 seems to do something similar."

Section 4 actually describes a suitable extension of a simple, transfer-function based simulation model (described in more detail in Appendix A), to incorporate the (long-term) cryosphere contribution derived in Section 3. This roughly defines the dynamic simulation core which stands at the basis of the multi-scale simulation model, in the paper referred to as the "simulation set-up".
Section 5 presents a first 'validation' of this combined set-up, by reproducing both 'short' and 'long-term' responses to different possible present-day GHG mitigation scenarios such as provided by the IPCC.
Again, this should be made more clear to the reader, in my opinion feasible by adapting the introductory and concluding text of the sections with this objective in mind.

"Your **Methods** section provides interesting mathematical analysis and model comparison. However, is this the objective of your simulation, and is this what you wish your students to learn? If so, then it does not seem to match (fully?) your objectives as laid out at the start.

All that gives the impression that your accomplished (as opposed to your stated) **objective** is to discuss aspects of climate modelling. Of course, that is of crucial importance, and is discussed in several climate journals, two of which are published by the AGU and the EGU. Again, *Geoscience Communication*, as eclectic and interdisciplinary as it is, does not, in my view stretch that far, unless it is to discuss how such models can communicate aspects of geoscience. May I suggest that you bring out this aspect of your article: How does your tool (better) communicate, and how do we know that it does?"

The purpose of Section 6 is to add a second (analytical) 'validation' to determine how my multi-scale simulation set-up performs in relation to 'new findings' on contemporary estimates of climate sensitivity based on the output of complex GCM's (General Circulation Models) as reported in the recent Nature study of Cox et al. (2018). I agree that this should be made much more clear to the reader in the section intro, again with the original objectives of the study in mind.

"My suggestion is to focus on your simulation as a **learning tool**. For example, you could discuss (and measure and analyse) the various ways in which students benefit from your simulation – how your simulation is revived by, and communicates climate change to, a given audience. You can of course, focus on a (small) selection of (already existing) models, and allow students to manipulate the various variables and feedbacks in the climate system: GHG behaviour, feedback loops (eg, increase in atmospheric $H2O$, thawing of $CH4$ substrates), albedo effects, etc. This audience is likely to be a more sophisticated audience."

I agree that this would really be the 'proof of the pudding' of the "STAGE 2.0" endeavour, however at this stage not feasible yet. Once given the opportunity to integrate my model in an actual educational set-up, various options would become available for a proper human-factors evaluation. This could either be of a formative or summative nature, by carefully designing an experimental set-up in combination with adequate instructional design for a proper measure of ‘information/knowledge’ transfer to the student for the different models under consideration.

“At one point you say “The main learning objective is to ‘get a feel’ for both ‘short-term’ (current century) and possible ‘long-term’ (beyond) consequences of greenhouse-gas **mitigation** measures.” However, I could not find how students in your simulation would manipulate variables representing mitigation measures and thus see their effects.”

I agree that at least some additional explanation is required in Sections 4 and 5 on how model inputs were specified to generate the different simulation results presented there. For the implementation in a pedagogical context the very powerful concept of ‘direct manipulation’ would be recommended, enabling students to manipulate both model inputs (e.g. GHG emissions in GtC/year) and parameters with an immediate feedback of both short- and long-term consequences. The underlying STAGE 2.0 simulation core is exactly designed for this purpose.

“You say that “The conceptual design of the tool is based on the paradigm ‘**learning as experimenting**’, encouraging students to explore climate sensitivity in its various aspects in an active manner.”. In my view, this is what your article should focus on, not the detailed analysis of the validity of various climate models. You state that your tool aims to counter common misconceptions [regarding the climate system]. This sounds like it is intended for a lay or general-public audience, not students specializing in climate models. If so, then the mathematics will not serve any purpose. In a simulation, you need to strike a careful balance between detail (a high fidelity simulation) and relatively simple pedagogically-useful simulation. The beauty of pedagogical simulation is its ability to represent reality at the most useful level of representivity for a given audience (sufficiently simple to provide powerful insight and so as not to swamp the main message, and sufficiently complex to provide realistic insight); the more sophisticated (educated) the audience, the more complex the simulation. At a certain point of increasing sophistication, the simulation will cease to have a pedagogical purpose and will manifest a research purpose, poorly adapted to helping lay people understand. Some useful discussion on this has been published, and could be cited.”

Regarding the ‘common misconceptions’ in relation to the level of the intended audience, I admit that I am aiming for an application in a university-level course on climate change. The ‘common’ refers to that also in this specialistic field misconceptions might be present of a rather persistent nature.

Regarding model complexity I totally agree that this should be determined by the learning objectives for the intended audience, also in relation to my previous comment on specifying model inputs. A typical (complex) GCM (General Circulation Model) as the ones presented in Table C1 used for my analytical STAGE 2.0 model validation (Section 6 of my paper) may take up to months of ‘calculation time’ (interval between specification of model input to generation of model output), which makes the concept of ‘direct manipulation’ totally unworkable! Hence, the absolute need for model simplification, which for a qualitative sensitivity study in a pedagogical setting shouldn’t cause any real problems with respect to required realism (here the model validation sections in my manuscript come in). The mathematics in my paper is solely intended to derive/describe the simple model in a rigorous manner, as a means of ‘information transfer’ to potentially interested users (a.o. pedagogical software developers in the field on climate-change education).
I will explicitly address these issues in the introductory sections of my paper, also in relation to your next comment.

“You mention “the paradigm ‘**learning as experimenting**’, encouraging students to explore climate sensitivity in its various aspects in an active manner”. You really do need to provide references to this method. I would probably not call it a paradigm, but rather a method or an approach. A widely used approach goes under the name of the '**experiential learning cycle**', pioneered by Dave Kolb. Simulation designed and conducted within the framework of this cycle tends to provide a powerful method for communication, and is thus relevant to *Geoscience Communication*. However, a word of warning: No game, simulation or role-play or similar activity can hope to produce its full learning potential without the crucial step of **debriefing**. For the purpose of debriefing, it would be useful for facilitators and participants to have the underlying model, probably in non-mathematical terms, for example, as a system dynamics model. One question in the debriefing might cover 'what if' this or that variable in the model were modified?"

I agree, embedding the pedagogical approach of 'learning as experimenting' in existing methods of active learning (Kolb's experiential learning cycle, constructivism/constructionism) deserves more attention in the paper. Again, to my opinion this belongs in the Introduction section, as it provides the pedagogical basis for my STAGE 2.0 model development.

Your suggestion of the *'what-if'* like manipulation of model inputs and parameters directly fits into the objective of designing a proper experimental set-up in case of a human-factors evaluation of the STAGE 2.0 set-up, as mentioned above in my response. This could nicely be complemented with so-called *'how to'* exercises, asking students to determine the required input (e.g. GHG concentration in the atmosphere) in order to achieve a certain output of the climate system (Global surface temperature). This would provide valuable material for an effective debriefing session on how the concept of 'climate sensitivity' is appreciated by the students, also in relation to your final comment:

"I am not sure if you have done this, but a study on the **communicative effectiveness** for the various audiences of your simulation would contribute greatly the literature. Simulation can be a particularly powerful tool for communicating insights into geoscience phenomena, but it and its use (including the debriefing) need to be evaluated in a rigorous manner."