

Author Responses to Reviewer #2's Comments

Original referee comments are in italics in black

Author responses are in blue

“Claiming that the investigation presented here is “comprehensive,” in a way that no previous studies have been, is simply incorrect. The authors present 5 injection strategies. Four of these are actually the same strategy, but with different injection latitudes - so actually only 2 different strategies. This is very much in line with previous similar studies in the literature, including ones that share many of the same co-authors with this paper. So this choice of language is deeply puzzling.”

We agree with the reviewer that the word “comprehensive” is not quite the right choice of word, and have replaced that with the word “novel”. We have changed the title to “Novel Hemispherically-Symmetric Strategies for Stratospheric Aerosol Injection”.

This study systematically explores how the choice of SAI strategy affects climate responses, which is a key dimension of the range of possible climate responses to SAI. Our use of the term “strategy” is defined clearly on Line 36, and is the same as usage in other papers. Injecting at different latitudes and/or seasons are considered as different injection strategies; that is, the “strategy” describes all the different choices regarding how one meets a particular temperature target. This study describes four hemispherically-symmetric injection strategies, including three strategies that are introduced for the first time and one equatorial injection strategy. Previous studies only look at up to two strategies at the same time. Zhang et al. (2022) have estimated that there are 6-8 injection strategies that produce detectably different surface climate responses, when providing 1C global cooling. The selection of these four injection strategies is based on the conclusion in Zhang et al. (2022), and is explained in Line 33-66, and Line 76-111. We have modified the paragraphs in Line 76-111 to better justify the selection of these strategies.

“Far too little information is given on the technical approach. This aspect of the paper reads like an internal report rather than a manuscript for the literature. The other reviewer also commented on this. More information is needed on the model and climate scenario underpinning the simulations.”

The climate model and global warming scenario are clearly explained in Section 2 and 3. The climate model used is CESM2(WACCM6), which is described in Section 2 – Climate Model. The global warming scenario is SSP2-4.5, which is described in Section 3 – Simulations. Additional details on the controller are added as described below.

“The authors are surprisingly vague about the "controller(s)" which are used to determine injection rates. Equations and parameters for this technical feature need to be shared - along with some discussion of how this would be implemented in any kind of practical sense. The authors are directed to another paper for these details - which would not be sufficient even if the reference trail were clear - but it is not at all clear what paper is being referenced here (after 10 minutes searching I did not find a Visoni et al. 2022 with this title).”

The current manuscript refers to the preprint of the Visoni et al. study that includes most of the important details behind the controller. Since this study has been accepted and published in 2023, the correct citation should be Visoni et al., 2023. We apologize for the confusion, and have now corrected the typo. Visoni et al. 2023 describes the sensitivity to injection, and MacMartin et al., 2014 and Kravitz et al., 2017 describe more generally how the controller is designed. We have added a paragraph describing the details of the controller implementation for the strategies described here.