

## ***Interactive comment on “Harnessing Stratospheric Diffusion Barriers for Enhanced Climate Geoengineering” by Nikolas O. Aksamit et al.***

**Anonymous Referee #1**

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An interesting approach to identifying ideal aerosol-injection sites. The results convincingly show the improvement obtained by finding optimal sites via the Diffusion Barrier informed approach compared to the fixed site approach. Furthermore, the authors not only look at just the wind fields, but re-do the microphysics calculations necessary to determine how the injected aerosols may affect the wind field.

The presentation needs some cleaning up and clarification:

- Line 28, missing citation
- Line 44, missing comma (turbulence coherence and mixing → turbulence, coherence and mixing)

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ence and mixing)

- Line 63, says figure 4 but I think mean to reference figure 2.
- Line 145, the definition of DBS. It appears to be non-dimensional. Is that correct?
- Line 147, there are typos in the definition of  $\mathbf{T}_{t_0}^t(\mathbf{x}_0)$ , the superscript of  $\mathbf{T}$  and the first argument of  $\mathbf{D}$ . The definition should be,  $\mathbf{T}_{t_0}^t(\mathbf{x}_0) = [\nabla_0 \mathbf{F}_{t_0}^t]^{-1} \mathbf{D}(\mathbf{F}_{t_0}^t, t) [\nabla_0 \mathbf{F}_{t_0}^t]^{-T}$ . Given the importance of this definition, I suggest not having it as an in-line equation; give it its own equation line.
- lines 151 and 153, typo in the superscript of  $\mathbf{F}$
- Figure 3. This figure was a bit confusing. It took some time to realize that the background grayscale in the upper left figure was related to  $DBS_{BW}$  whereas in the upper right it was  $DBS_{FW}$ . Also, why is it in a log scale,  $\ln(DBS)/2t$ , and what is  $t$ ? The advection time-scale, so 7 days? What are the units of this log scale? Inverse days?
- Lines 176-185, This section seems to describe the identification of DBS-informed injection sites. But it does not appear to be automated. Does this involve a human-in-the-loop for each month during the two decade simulation time? Could this procedure be automated to optimize some cost function, such as the main two metrics given?
- Figure 5, the subplot labels (a),(b), etc are too small to see. The curves in the lower two plots are not labeled.
- Figure 7, DBS vs. Airport DBS: look very similar. How much did the airport restriction actually affect the choice of injection sites?
- line 308, it says Figure 8, but I think this is about Figure 9.

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- Figure 10, does larger effective aerosol radius correlate to more coagulation? I am assuming this is the case but it was not stated.
- While it is good to see the mean distance quantity and entropy, how much of an effect are these things having on the actual reduction in global temperature? Sure the DBS informed location sites will spread out more and coagulate less and it is clear that will reduce the temperature but is not clear by how much. Would be helpful to know.

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