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Interactive comment on "Construction of an Eulerian atmospheric dispersion model based on the advection algorithm of M. Galperin: dynamic cores v.4 and 5 of SILAM v.5.5" *by* M. Sofiev et al.

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This article presents a scalar advection scheme, of which there are already very many, as shown in the introduction. In particular, this Galperin scheme is already well documented in the several referenced papers of Galperin. The paper mentions the development of the SILAM dynamical cores, the model's boundary conditions, the need to modify the scheme to be useful over complex topography or near strong gradients and fronts, vertical advection, modeled diffusivity and turbulence mixing, and aerosol size spectra advection, but the only results shown are for idealized 2D scalar advection tests, and does not demonstrate any potential advantages for this advection scheme, other than that it performs modestly well in these tests and converges at only first order. The only test that demonstrates the advantages of the new scheme is in Figure 4, showing an improvement over the original Galperin scheme.

Given that this scheme has been implemented in a full 3D dynamical core and a full-physics atmosphere model, it should be possible to demonstrate all of these things, rather than showing numerous traditional test cases which do not illuminate the improvements made (presumably with much effort by the authors) to this scheme needed for realistic model simulations. Since there are so many existing scalar advection schemes, the authors need to show what distinguishes this scheme from the others, especially once it is coupled to a dynamic model.

- Are there any demonstrations of this revised scheme in either a 3D dynamical core or in a full model?
- How well does this scheme maintain a given aerosol size spectrum? How much improvement is found by using the method in section 3.3?
- How well does this scheme perform near complex topography?
- First-order advection schemes may be too diffusive for many realistic applications. Are there any plans to extend this scheme to better than first-order accuracy?

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Interactive Comment