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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Climatic consequences of regional nuclear conflicts" *by* A. Robock et al.

Anonymous Referee #2

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Comments: The major point that distinguishes this work from previous published papers on the subject (and completely governs the result) is the concept that black carbon absorption will lift the aerosols into the upper stratosphere, where there will be a long residence time. To prove this, the authors use an 'off-the-shelf' soot model in GISS model E, a soot model which is derived primarily from sources like diesel exhaust. The soot model has a mean effective radius of 0.1 microns. The critical question is: how do the results depend upon the assumption of black carbon size, since 100 Hiroshima-class nuclear weapons undoubtedly would throw up a very wide size range of particles. For the particles used here - spherical particles - the radiative properties do depend upon size. The size will also impact the radiative impact if it actually does get into the upper stratosphere. In addition, with such extreme forcing, there is likely to be an internal mixture of particles whose radiative characteristics could vary widely. In fact, the radiative properties of smoke from forest fires varies widely by itself. So from the the-

oretical standpoint, there are many uncertainties concerning whether this mechanism would really be operative following such a nuclear engagement. From the observational side, there is no evidence that I am aware of indicating that the solar absorption component of ash (as is thrown up in some volcanoes) really does induce convection. The companion article (by Toon et al.) doesn't mention any either - referring just to two 'private communications' concerning mesoscale models.

Could it happen? Perhaps, but using a model's convection scheme is certainly not a very strong reed to lean on, especially when considering the extreme static stability of the stratosphere and the very uncertain radiative forcing that is employed. This paper would have to be labeled very speculative, and for a subject this important, could only be published if the authors did one of two things: (1) Conduct radiative-convective model experiments varying the aerosol properties within range of what their imagination can come up with, and report how the results varied; or (2) Emphasize the uncertainties to a much greater degree than is currently done (where they are basically argued away). Approach (1) would be preferable, and would more clearly round out this study with the sort of careful assessment of uncertainty that it deserves.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 11817, 2006.

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