



Climatic Consequences and Agricultural Impact of Regional Nuclear Conflict

Alan Robock (1), Michael Mills (2), Owen Brian Toon (3), and Lili Xia (1)

(1) Rutgers University, Department of Environmental Sciences, New Brunswick, NJ, United States

(robock@envsci.rutgers.edu, lxia@envsci.rutgers.edu), (2) National Center for Atmospheric Research, Boulder, Colorado

USA (mmills@ucar.edu), (3) Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, Colorado USA
(Brian.Toon@lasp.colorado.edu)

A nuclear war between India and Pakistan, with each country using 50 Hiroshima-sized atom bombs as airbursts on urban areas, would inject smoke from the resulting fires into the stratosphere. This could produce climate change unprecedented in recorded human history and global-scale ozone depletion, with enhanced ultraviolet (UV) radiation reaching the surface. Simulations with the NCAR Whole Atmosphere Community Climate Model (WACCM), run at higher vertical and horizontal resolution than a previous simulation with the NASA Goddard Institute for Space Studies ModelE, and incorporating ozone chemistry for the first time, show a longer stratospheric residence time for smoke and hence a longer-lasting climate response, with global average surface air temperatures still 1.1 K below normal and global average precipitation 4% below normal after a decade. The erythemal dose from the enhanced UV radiation would greatly increase, in spite of enhanced absorption by the remaining smoke, with the UV index more than 3 units higher in the summer midlatitudes, even after a decade.

Scenarios of changes in temperature, precipitation, and downward shortwave radiation from the ModelE and WACCM simulations, applied to the Decision Support System for Agrotechnology Transfer crop model for winter wheat, rice, soybeans, and maize by perturbing observed time series with anomalies from the regional nuclear war simulations, produce decreases of 10-50% in yield averaged over a decade, with larger decreases in the first several years, over several regions in the midlatitudes of the Northern Hemisphere.

The impact of the nuclear war simulated here, using much less than 1% of the global nuclear arsenal, would be devastating to world agricultural production and trade, possibly sentencing a billion people now living marginal existences to starvation. The continued environmental threat of the use of even a small number of nuclear weapons must be considered in nuclear policy deliberations in Russia, the U.S., and the rest of the world