

SEMINAR

Climatic and Humanitarian Impacts of Nuclear War

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A nuclear war between any two nations, such as India and Pakistan, with each country using 50 Hiroshima-sized atom bombs as airbursts on urban areas, could inject 5 Tg of soot from the resulting fires into the stratosphere, so much smoke that the resulting climate change would be unprecedented in recorded human history. Our climate model simulations find that the smoke would absorb sunlight, making it dark, cold, and dry at Earth's surface and produce global-scale ozone depletion, with enhanced ultraviolet radiation reaching the surface. The changes in temperature, precipitation, and sunlight from the climate model simulations, applied to crop models show that these perturbations would reduce global agricultural production of the major food crops by 10-40% for a decade. The impact of the nuclear war simulated here, using much less than 1% of the global nuclear arsenal, could sentence a billion people now living marginal existences to starvation. The greatest nuclear threat still comes from the United States and Russia. Even the reduced arsenals that remain in 2019 due to the New START Treaty threaten the world with nuclear winter. The world as we know it could end any day as a result of an accidental nuclear war between the United States and Russia. With temperatures plunging below freezing, crops would die and massive starvation could kill most of humanity.

My current research project, being conducted jointly with scientists from the Universities of Colorado and Chicago, and NCAR, is examining in detail, with city firestorm and global climate models, various possible scenarios of nuclear war and their impacts on agriculture and the world food supply. We use the Whole Atmosphere Community Climate Model, version 4, at 2° horizontal resolution and 70 vertical layers, with transport and removal of soot from fires handled by the Community Aerosol and Radiation Model for Atmospheres, which treats soot as fractal particles. As a result, the size of particles is not fixed and can change depending on the rate of coagulation and sedimentation. We simulate injections of 5, 16, 27, 37, 47, and 150 Tg of soot into the lower stratosphere, which could result from different nuclear war scenarios. The results, except for slightly shorter stratospheric aerosol lifetimes, support previous work with lower resolution climate models. Since India and Pakistan now have more nuclear weapons with larger yields, and their cities are larger, even a war between them could produce emissions of 37 or 47 Tg of soot.

As a result of international negotiations pushed by civil society led by the International Campaign to Abolish Nuclear Weapons (ICAN), and referencing our work, the United Nations passed a Treaty to Ban Nuclear Weapons on July 7, 2017. On December 10, 2017, ICAN accepted the Nobel Peace Prize "for its work to draw attention to the catastrophic humanitarian consequences of any use of nuclear weapons and for its ground-breaking efforts to achieve a treaty-based prohibition of such weapons." Will humanity now pressure the United States and the other eight nuclear nations to sign this treaty?

Monday, June 24, 2019, 3:30 p.m

Refreshments 3:15 p.m

NCAR Foothills Laboratory

3450 Mitchell Lane, Boulder, CO 80301

FL2-1022, large seminar room

Live webcast: <http://ucarconnect.ucar.edu/live>

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