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'Nuclear winter' may kill more than a nuclear war

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Debora MacKenzie

A regional exchange of relatively small nuclear weapons could plunge the world into a decade-long "nuclear winter", destroying agriculture and killing millions, according to a new study.

Weapons experts to consider that small-scale nuclear exchanges are now more likely than the massive US-Soviet exchanges feared during the Cold War.

In the 1980s, scientists calculated that such exchanges would put enough smoke into the atmosphere to shade the Earth from the Sun, causing a nuclear winter.

Now scientists have re-calculated the likelihood of nuclear winter using modern, vastly improved climate models and a more likely modern scenario for small-scale nuclear war. Brian Toon, head of atmospheric and oceanic sciences at the University of Colorado at Boulder, and Alan Robock of Rutgers University in New Jersey, both in the US, predict less cooling than the 1980s modellers. However, they predict the cooling would last longer, with potentially devastating consequences.

Different targets

The pair modelled the impact of 100 explosions in subtropical megacities. They modelled 15-kilotonne explosions, like the Hiroshima bomb. This is also the size of the bombs now possessed by India and Pakistan, among others.

The immediate blast and radiation from the exchange of 100 small nuclear bombs killed between three million and 16 million people, depending on the targets. But the global effect of the resulting one-to-five million tonnes of smoke was much worse. "It is very surprising how few weapons are needed to do so much damage," says Toon.

This is partly because modern scenarios aim at different targets. Toon says most of the huge US and Russian nuclear warheads are aimed, in a first strike, at missile silos in wilderness or suburban military installations. There is not much to burn, and after the first warhead hits, subsequent explosions do not release much additional smoke.

Urban firestorm

By contrast, a regional exchange where adversaries target each others' megacities would ignite huge urban firestorms. Toon calculates the smoke released per kilotonne of explosive yield would be 100 times greater than in the Cold War scenarios.

Moreover, it lasts longer. The 1980s models, says Toon, did not extend into the upper atmosphere far enough, and could not be run long enough to discover this.

"Soot from fires is black and absorbs solar radiation," Robock told **New Scientist**. "As it begins to fall it is constantly being heated and lofted." Such particles, they calculate, rise to the upper atmosphere and stay for more than six years.

Global chill

In comparison, Robock says, particulates from a volcanic eruption, which stay in the lower atmosphere and last only about a year, have nevertheless cooled the planet enough to cause famine.

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Even taking global warming into account, the models predict that the cooling of the planet for a decade following the exchange would be nearly twice as great as the global warming of the past century, causing colder temperatures than Europe's "Little Ice Age" of the 16th to 18th centuries.

Although this might look perversely like a welcome counter-balance to global warming, the researchers say it would cause equally devastating changes in weather patterns and rainfall. That, plus reduced sunlight, would shorten growing seasons and destroy crops worldwide, to the detriment of all.

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Brian Toon's research group, University of Colorado at Boulder

<http://lasp.colorado.edu/aerosol/toon.php>

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