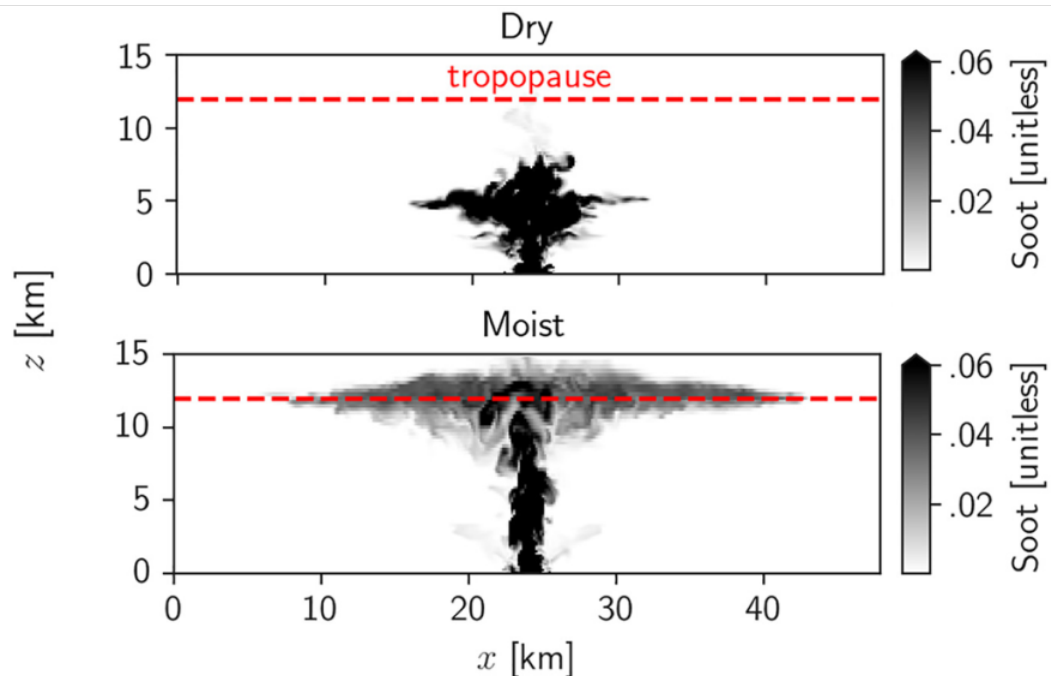


How Can Nuclear Plumes Reach the Stratosphere?

A new study shows how moist convection can lift sooty air from firestorms to the stratosphere, potentially leading to a nuclear winter.

By Minghua Zhang

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Distribution of soot concentration as a function of height and horizontal distance from the center of the firestorm obtained from large eddy simulations. The dry simulation is on the top, and moist simulation is on the bottom. Soot cross sections are evaluated at the end of simulations and in the center of the domain. The moist simulation uses 70 percent relative humidity. Credit: Tarshish and Roms [2022], Figure 6 (modified)

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Source: *Journal of Geophysical Research: Atmospheres*

Acts of war have ignited city-wide fires whose smoke rose high up into the atmosphere. If this smoke rises above the weather layer, the smoke is stuck at high altitudes for months to years and spreads out across the globe. While aloft, smoke shades the surface of the Earth. A concern is that global food production could be jeopardized by severe cooling due to high-altitude smoke.

To understand how much surface smoke actually reaches high altitudes, [Tarshish and Romps \[2022\]](#) use analytic plume calculations and direct numerical and large-eddy simulations to show that condensing water vapor plays an essential role in powering the ascent of smoke plumes to ascend to climate-altering heights.

Citation: Tarshish, N., & Romps, D. M. (2022). Latent heating is required for firestorm plumes to reach the stratosphere. Journal of Geophysical Research: Atmospheres, 127, e2022JD036667. <https://doi.org/10.1029/2022JD036667>

—Minghua Zhang, Editor in Chief, *Journal of Geophysical Research: Atmospheres*

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