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Localized Pollution Potentially Plays Large Role in Future Climate Change

Short-lived gases and particle pollutants - which stay in the atmosphere for just days or weeks - have a greater influence on Earth's climate than previously thought, according to a new NOAA-led report released today as part of the series of Synthesis and Assessment Reports coordinated by the U.S. Climate Change Science Program. The report also says that while these pollutants are generated locally they will have global climate implications.

Such short-lived pollution includes black carbon (soot), low-altitude ozone, nitrates and sulfates. Each type of pollution influences surface temperatures differently - from the cooling influence of sulfate particles, which tend to reflect sunlight, to the warming characteristics of heat-absorbing black carbon.

The full CCSP report, *Climate Projections Based on Emissions Scenarios for Long-Lived and Short-Lived Radiatively Active Gases and Aerosols,* and a companion summary brochure are available online at climatescience.gov.

"Previous research suggests that the warming of the surface climate by increasing levels of long-lived greenhouse gases has been partially offset by increasing levels of those short-lived particles that reflect sunlight. This study found that over the 21st century the climate impacts of projected changes in human emissions of short-lived gases may in fact enhance global warming," said Hiram "Chip" Levy, Ph.D., senior research scientist at NOAA's Geophysical Fluid Dynamics Laboratory in Princeton, N.J. and co-author of the new report.

While short-lived pollutants are generated locally and tend to be concentrated close to their source, they exert a global influence. The report cites a climate model projection of emissions and pollutant levels over Asia that results in a rise in temperature and a decline in rainfall over the continental United States during the summer throughout the second half of this century.

"By 2050, projected changes in short-lived pollutant concentrations in two of the three studies are responsible for approximately 20 percent of the simulated global-mean annual average warming. By 2100, changes in the levels of short-lived gases and particles could account for a significant portion of the predicted warming, due to a projected increase in black carbon and ozone and a decrease in sulfate," said Drew Shindell, Ph.D., climate scientist at NASA's Goddard Institute for Space Studies in New York and co-author of the new CCSP report. "However, these climate impacts depend on emission forecasts far into the future, and the range of reasonable emissions projections is very large, even for a single economic and technology storyline."

For instance, "This report finds that reducing black carbon emissions in the domestic energy/power sector in Asia appears to offer the greatest potential for substantial, simultaneous improvements in local air quality and global climate. Reduction in emissions from ground transportation in North America could have similar beneficial impacts," said Alice Gilliland, Ph.D., a lead author of the new CCSP report and previously a physical scientist with NOAA's Air Resources Laboratory. "To assess potential impacts of air quality management actions on future

climate, current decision-making tools must be extended to consider local and global scales concurrently. There is a critical n*ee*d for integrated decision-making with respect to air quality and climate mitigation."

NOAA understands and predicts changes in the Earth's environment, from the depths of the ocean to the surface of the sun, and conserves and manages our coastal and marine resources.

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