SCIENCE NEWS of the week

New Research Clouds Pollution Picture

A spate of studies published over the past week is refining our understanding of how air pollutants form and affect ecosystems. The new research indicates that the chemistry generating and directing air pollution throughout the environment is more complicated and potentially quite different than scientists had envisioned. Several of the studies suggest policymakers should begin considering new solutions to managing this pollution.

For example, by challenging the prevailing notion that hydrocarbons emitted by trees have a negligible role in urban smog, one of these new studies calls into question the current U.S. policy of attempting to limit smog-ozone formation with controls on hydrocarbons emitted by combustion and other human-related activities. This policy might work if the vast majority of non-methane hydrocarbons causing smog-ozone came from such activities, says William Chameides, an atmospheric chemist at the Georgia Institute of Technology in Atlanta. But they don't, according to calculations he and his co-workers present in the Sept. 16 SCIENCE.

Trees — even in areas as urban as Atlanta — constitute a source of hydrocarbons "as large as if not larger" than that generated by human activities, Chameides says. Most air pollution analysts have discounted the contribution of trees, however, because their emissions constitute such a small fraction of the hydrocarbons present in air, he says. Ironically, he notes, because tree-generated hydrocarbons are 50 to 100 times more reactive than most of their human-generated counterparts, they disappear quickly. But since it's in the reactions generating ozone that they disappear, Chameides points out, their significance is anything but negligible. Ozone can stunt plant and tree growth.

Computer models developed by the Environmental Protection Agency indicate Atlanta could come into compliance with the federal air quality standard for ozone by reducing human-related hydrocarbon emissions 30 percent — a large but feasible goal. However, Chameides' data show that when the trees' contribution is accounted for, that same computer program indicates the federal ozone standard will be attained only by reducing human-related hydrocarbon emissions between 70 and 100 percent.

This does not suggest that controls on combustion emissions are worthless, he says, but instead that policymakers may be controlling the least effective class of them. Chameides says his data indicate that reducing the nitrogen oxides produced by combustion — a more recalcitrant class of pollutants — would offer more payoff in urban-ozone control than reducing hydrocarbons.

Another new study reports that low-lying clouds, like those veiling many mountaintops, tend to be dramatically more polluted — and acidic — than the rain or snow that falls from them. The cloud-pollutant levels measured at 10 sites in North America tend to be higher in the East than the West. But two trends persist regardless of region, notes Yale University ecologist F. Herbert Bormann, one of the study's organizers: Pollutants are much more concentrated in the clouds than in rain, and the higher the clouds, the more concentrated their pollutant levels tend to be. Depending on the site and the mineral or ion measured, individual clouds contained from 2 to 126 times more of the pollutant than rainwater, according to their data, reported in the September ENVIRONMENTAL SCIENCE AND TECHNOLOGY.

Bormann suspects the pollution in cloudwater is more concentrated because its droplets are smaller — and less dilute. What his team has yet to correlate are the effects, if any, of periodically bathing high-elevation forests in highly acidic and polluted cloudwater.

However, forest "epidemiologist" Robert Bruck is tackling just that. A plant pathologist at North Carolina State University in Raleigh, he described preliminary findings from ongoing field studies atop Mount Mitchell in that state during congressional testimony this week and in a report published last week by the Washington, D.C.-based World Resources Institute.

In two episodes he observed in June 1987 and 1988, low-lying clouds bathed budding spruce and fir in a vapor considerably more acidic than vinegar. Within 48 hours of each event, he found newly "burnt-back needle tips." They actually looked singed, he says, and contained 7 to 11 times more sulfate than healthy needles. This doesn't prove the clouds were to blame, he notes, but from an epidemiologic standpoint "it's certainly very suggestive."

Such data also suggest that "with the Clean Air Act awaiting reauthorization by Congress, now is the time to reexamine our basic approach to reducing air pollution," according to Mohamed T. El-Ashry, a vice president and coauthor of the World Resources Institute report. Instead of primarily controlling emissions exiting the tailpipe and smokestack, El-Ashry argues, policy should move toward burning less fossil fuel. *— J. Raloff*

EPA survey elevates concern over radon

Last year, the Environmental Protection Agency named radon — estimated to cause up to 20,000 U.S. lung cancer deaths annually — the biggest air- and water-pollution problem (SN: 8/15/87, p.105). But results of a new indoor-radon survey, announced this week, suggest the natural radioactive pollutant is an even more widespread and serious health hazard than previously suspected.

"I think it's clear that we have a national problem," says EPA Administrator Lee M. Thomas, who now recommends that "virtually everyone" test their dwelling for radon — especially those living in a detached house, an attached row house, a trailer or the basement or first two floors of apartment buildings.

In the new study, radon levels exceeded the EPA's action level of 4 picocuries per liter (pCi/l) in 1 out of 3 of the 11,000 homes the agency monitored last winter in Arizona, Indiana, Massachusetts, Minnesota, Missouri, North Dakota, Pennsylvania and several midwestern Indian lands. Last year's survey in 10 other states found that 1 in 5 homes exceeded a reading of 4 pCi/l. According to Richard Guimond, director of EPA's radiation programs, this concentration poses about the same lung-cancer risk to dwellers as smoking half a pack of cigarettes daily or receiving 200 to 300 chest X-rays annually.

Emitted by rocks in the soil, radon enters homes largely through cracks in a building's foundation. The new study identified a large, previously unrecognized geological "hotspot" contributing to excessively high radon levels in North Dakota and Minnesota. Unlike Pennsylvania's notorious "Reading Prong," where radon-emitting granite bedrock lies close to the surface, the newly identified hotspot results primarily from glaciation, Guimond says. Not only did the last glacial advance dump uranium-bearing rocks there, but it also scraped away covering materials in some areas — bringing bedrock closer to the surface — and increased soil porosity. As a result, the three highest indoor-radon readings in EPA's 17-state sampling — from 127 to 184 pCi/l — have been recorded in North Dakota.

— J. Raloff