Air Pollution May Have Bright Side

Aerosols may have cooling effect

By Denise Gibbon

Next time you're in bumper-to-bumper traffic and you see diesel smoke from the tailpipe of the car in front of you, there might be a reason to think it's a good thing.

The smoke, according to Center Moriches resident Stephen Schwartz, is an aerosol, and aerosols might be offsetting global warming caused by the release of carbon dioxide and other chemicals from the combustion of fossil fuels. Emissions of air pollutants, smoke, haze, and smog are all aerosols.

A senior scientist in atmospheric sciences at Brookhaven National Laboratory in Upton, Mr. Schwartz is the lead scientist on a team that recently demonstrated that microscopic aerosol particles from industrial processes could increase the brightness of clouds. Dubbed "the brightening effect," the process results in greater reflection of sunlight and cools the Earth.

It's important, said Mr. Schwartz, because it will help scientists assess the magnitude of global climate change.

"We have only one climate," said the scientist last week. "If you only take into account the carbon dioxide and omit other influences on climate, you'll get the wrong answer. We're saying aerosols are also influencing climate, but until now, there wasn't a good way to quantitatively measure it."

Scientists have long suspected that industrially generated aerosol particles increase the brightness of clouds. A decade ago, Mr. Schwartz and his team of Brookhaven and Purdue University scientists decided to find out if the suspicion was true.

Combining satellite measurements of cloud brightness, water content, and other variables with model calculations of atmospheric aerosols, the team demonstrated that cloud reflectivity is higher on the days with higher aerosol content than on the days with lower aerosol levels.

While carbon dioxide is a colorless gas, said Mr. Schwartz, aerosols are visible.

"Aerosol is not about spray cans," said the scientist. "It's a technical term used by scientists that refers to a suspension of particles in air. Any smoke you see is an aerosol.

There is a lot of concern about putting carbon dioxide in the atmosphere, he said, because it warms the earth but the polluting aerosols might be cooling the climate at the same time.

"It's as if one person turned up the furnace and another turned on the air conditioning," said Mr. Schwartz. "The room isn't getting as hot from the furnace because someone turned on the air conditioning."

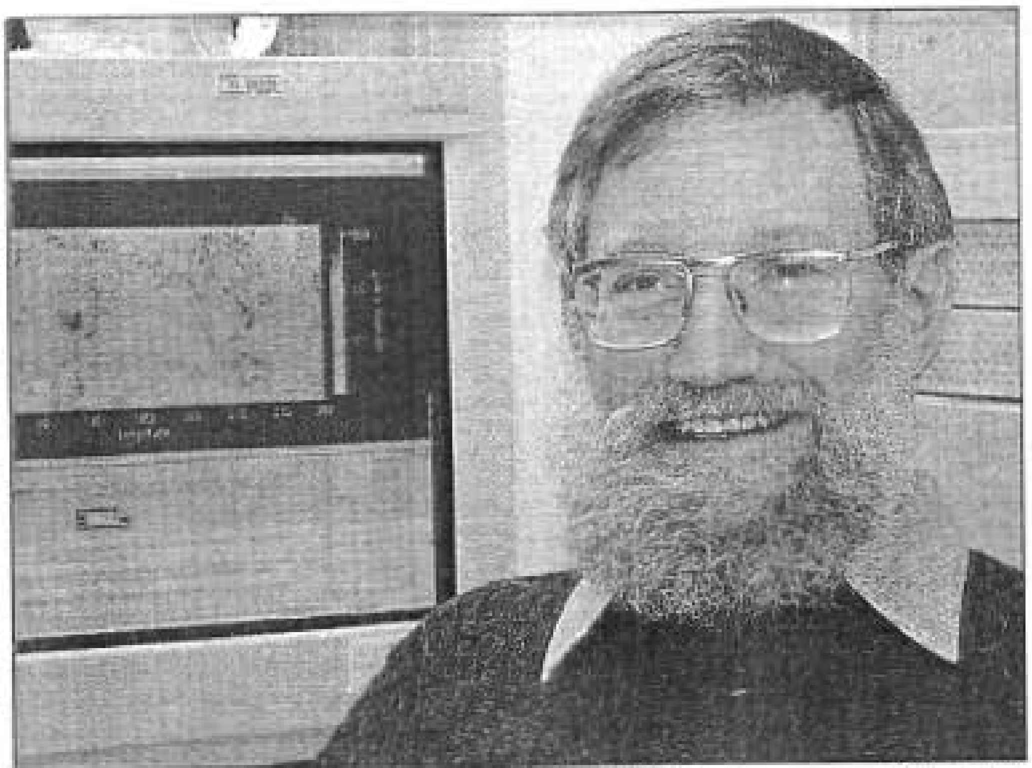
If scientists don't take into account the fact that the air conditioning is on, he said, they aren't considering the whole picture.

One of the biggest difficulties in measuring the effect of aerosols, said Mr. Schwartz, is determining their concentration. Aerosols such as sulfur compounds result from emissions by fossil-fuel-burning power plants and other industrial processes. They are typically found in the lowest three to four kilometers above earth's surface, he said, and precipitate out of the atmosphere in about a week.

"Because of their short residence time," said Mr. Schwartz, "it's tough to measure aerosol concentrations on a global scale."

The Schwartz team developed and refined a "chemical transport model" to calculate aerosol distribution. The model uses archived weather data and weather prediction models to track the distribution of aerosols from industrial sources to various parts of the atmosphere. Using the model, team members identified two one-week episodes in 1987 when the concentration of sulfate aerosol over the North Atlantic Ocean increased significantly and then decreased.

They then obtained data on cloud brightness—satellite measurements



Brookhaven scientist Stephen Schwartz in his office. DENISE GIBBON

reflected and how much light was transmitted through a cloud—for the same areas and time periods. Using these measurements, the scientists calculated the size of the cloud droplets and the amount of liquid water in the clouds.

Could aerosols be deliberately employed to offset the greenhouse effect?

"It's an attractive thought," said Mr. Schwartz, "but it cannot work in the long run because aerosols are so short-lived in the atmosphere, whereas greenhouse gases accumulate over time. We'd never solve the long-term problem."

The Brookhaven-Purdue team's findings, described in the February 19 issue of the "Proceedings of the National Academy of Sciences," should be accounted for in assessing the magnitude of global climate change, said Mr. Schwartz.

If the effect is as widespread as he thinks it is, he said, it would produce quite a substantial cooling effect on climate.

After graduating Phi Beta Kappa from Harvard College in 1963, Mr. Schwartz earned his doctorate from the University of California in Berkeley. A distinguished scholar, he was a Woodrow Wilson Fellow, 1963 to 1964, and a Fulbright Post-Doctoral Fellow from 1968 to 1969. He began his atmospheric chemistry work while teaching at the State University of New York at Stony Brook and moved on to cloud chemistry at Brookhaven in 1975. He later specialized in aerosols and aerosol cloud interactions.

Interested in chemistry since his childhood in St. Louis, he enjoys Brookhaven's summer science programs where he can help children understand how ordinary human activities affect their environment.

Mr. Schwartz would like to see junior high and high school chemistry teachers do more with concepts that help children appreciate the relationship between chemistry and their everyday lives.

"Everything we see and touch is made of chemicals," said the scientist.