OZONEWS

A weekly electronic news service on ozone protection & related issues compiled by:
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1. Future Looks Cloudy for Arctic Ozone

Pretty polar clouds hide troubling inner workings. (NASA)

Polar stratospheric clouds look lovely, glowing in streaks of spring Antarctic or Arctic sunrise. Yet the wispy wonders, around 20 kilometers up, are causing concern below. They create conditions that permit chlorine in the atmosphere to ravage the Earth's protective ozone layer.

This week at the spring meeting of the American Geophysical Union in Washington, D.C., scientists announced that more polar stratospheric clouds formed in Arctic skies last winter than had ever been recorded previously and that the clouds lasted longer. Meanwhile, researchers say, they observed significant ozone loss.

Polar stratospheric clouds hit the ozone layer with two punches. "These are the culprits in ozone loss," says NASA's Michael J. Kurylo of Washington, D.C., who is a leader of the project known as the SAGE III Ozone Loss and Validation Experiment (SOLVE).

On the surfaces of particles within the clouds, inactive chlorine compounds derived from human made chlorofluorocarbons convert into a reactive form that destroys ozone. If they linger, the clouds also drip nitric acid, lowering the nitrogen concentration in the stratosphere. Nitrogen mitigates chlorine's power to destroy ozone, and nitrogen loss-a process called denitrification-leaves chlorine free to attack ozone.

At the meeting this week, one international group of researchers reported preliminary results from last winter indicating more and longer-lived polar stratospheric clouds in the Arctic than they had expected. The data, obtained between December 1999 and March 2000, came from SOLVE instruments on aircraft.

"We did see patchy, severe denitrification," says SOLVE team member Eric J. Jensen of NASA's Ames Research Center in Moffett Field, Calif. However, he adds, the team must analyze more data before speculating on how widespread the phenomenon was and whether it might have contributed to the ozone losses observed last winter. Computer models suggest that even without denitrification, other processes can cause the lower stratosphere to lose 40 to 50 percent of its ozone, says Katja Drdla of Ames. With severe denitrification, she says, the loss can total 60 to 80 percent.

Also at the meeting, Azadeh Tabazadeh of Ames presented independent satellite measurements from the latest Arctic winter. Her group found that polar stratospheric clouds persisted 1.2 to 1.5 times as long as they did during the coldest winters of the 1990s. Her team reports signs of denitrification, "but it's not severe," Tabazadeh says. She adds, "Most of the [ozone] loss actually during this winter I don't believe was due to denitrification."

The reports follow a study by Tabazadeh and her colleagues in the May 26 *Science* that warned of unusually long-lived polar stratospheric clouds in the Arctic. They examined satellite measurements from a typical Antarctic winter in the 1990s and the two coldest Arctic winters of the decade. Tabazadeh's group found that polar stratospheric clouds lasted half as long in the Arctic as in Antarctica. Mathematical modeling by Tabazadeh's group suggests that if Arctic stratospheric cooling continues at 2°C per decade, such clouds could last twice as long in the Arctic during the coldest winters of the decade that will begin in 2010. The date could slip to the 2030s if cooling slows to 1°C each decade.

Severe denitrification could increase Arctic ozone loss by 30 percent once polar stratospheric clouds become twice as persistent, Tabazadeh's team speculates.

"I think the study she's done is really good," says Drew T. Shindell of NASA's Goddard Institute for Space Studies in New York. Aircraft studies and groundbased measurements depict localized conditions, he says, "but things change from region to region, so it's nice to have these global data sets from satellites."

"It's important to realize that the question is very closely connected to the bigger picture of carbon dioxide increases and [human-caused] climate change," adds Michael J. Newchurch of the University of Alabama at Huntsville. Earth's stratosphere cools as its surface warms.

Still, Tabazadeh suspects that the Arctic will not continue its cooling trend or produce annual ozone holes rivaling Antarctica's. "I don't think it can keep cooling and cooling . . . . It should either slow down very much or even reverse."

Source: *Science News*, Vol. 157, No. 23, 3 June 2000, by: J. Gorman, http://www.sciencenews.org/20000603/fob1.asp

2- EPA Finalizes Acceptability Decision on Halon Substitutes

An April 26 final rule issued by the U.S. Environmental Protection Agency (EPA) lists IG-100 and hydrochlorofluorocarbon (HCFC) Blend E as acceptable halon substitutes, subject to certain use restrictions, in designated fire suppression and explosion protection applications (65 FR 24387).

According to the final rule, IG-100, which is 100 percent nitrogen, is acceptable as a Halon 1301 substitute in total flooding applications under certain conditions.

Total flooding agents are used to put out fires in enclosed spaces and to prevent explosions. IG-100 does this by decreasing the amount of oxygen in a protected area to a level that will not support combustion, according to EPA. To protect employees and workplace personnel who may be present in areas where IG-100 is discharged, the final rule imposes specific design requirements on IG-100 systems.

Under the rule, IG-100 systems should be designed to maintain an oxygen level of 10 percent. A system that can lower the level of oxygen below this threshold may be used only in normally unoccupied areas and in areas where anyone who could be exposed to the chemical can evacuate within 30 seconds, the final rule states. If it takes longer than one minute to clear an area, the IG-100 system must be designed to maintain an oxygen level of at least 12 percent. In addition, if the possibility exists for oxygen levels to drop below 10 percent, the final rule states that employees must be evacuated prior to oxygen depletion.

EPA's comments accompanying its listing decision state that IG-100 systems must include alarms and warning mechanisms. The agency also notes that workplace personnel and employees should not remain in or re-enter an area where an IG-100 system has been discharged without appropriate personal protective equipment. These comments are not part of EPA's regulatory decision, the preamble states. In many instances, however, the agency's comments refer to operating practices that already are identified in existing industry or building code standards, according to EPA.

The final rule also makes HCFC Blend E acceptable as a Halon 1211 substitute for streaming agents used in nonresidential applications. Streaming agents are used in fire extinguishers.

HCFC Blend E is made up of HCFC, hydrofluorocarbon (HFC) and an additive, the preamble states. EPA has determined that HCFC Blend E causes less harm to the environment than Halon 1211. The ozone-depletion potential (ODP) of the HCFC in this blend is 0.02, and all other constituents in the blend have a zero ODP, according to the preamble. However, due to potential health risks, the final rule limits the use of HCFC Blend E to nonresidential applications.

Upon combustion, halocarbon fire extinguishing agents, including HCFCs and HFCs, break down to form hazardous products that are potentially toxic to humans, according to EPA. Users should avoid breathing gases produced by thermal decomposition of HCFC Blend E and evacuate and ventilate the area immediately after using the agent, EPA warns.

Section 610(d) of the Clean Air Act (CAA) prohibits the sale and distribution of HCFCs in fire extinguishers for residential applications. EPA recommends that all extinguishers containing this blend bear a label indicating the risks associated with using the product and handling procedures to reduce those risks.

Under CAA Section 612 and EPA's Significant New Alternatives Policy program, the agency has the authority to "list a substitute as acceptable only under certain conditions or narrowed use limits." EPA's use restrictions are designed to protect worker safety in the absence of U.S. Occupational Safety and Health Administration (OSHA) and other workplace limits. The agency does not intend to bar OSHA from regulating workplace safety with respect to fire protection, the preamble states.

Source: EPA, April 2000, For additional information contact: Meg Victor at (202) 564-9193 . Website: http://www.epa.gov

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