If carbon isotope and other studies confirm that the gases were volcanic and leaked slowly into the lake, then the likelihood that another cloud will be emitted from the lake in the near future is low. The greatest hazard at present, the team reports, is a very weak natural dam made of volcanic ash, which is located where the water leaves the lake at its northern end. The researchers worry that the dam will fail, causing a catastrophic flood, and in so doing might also possibly trigger another cloud by suddenly lowering the lake level.

As for the other volcanic lakes in the region, the team recommends an extensive monitoring program. Team member George Kling, a graduate student working with Livingstone, had previously taken deep-water samples of about 17 Cameroon lakes, including Lake Monoun, and has worked with surface samples of many more, including Lake Nyos. According to Livingstone, Kling had found that Monoun was much more chemically stratified than most of the other 16 lakes.

"If I lived near a deep lake anywhere in the world, I'd go out with my boat and my water sampler and I'd bring up a sample of deep water and see if it fizzed," says Livingstone.

In a Sept. 4 briefing to AID, chemist Jimmy Stewart at the F.J. Seiler Research Laboratory in Colorado Springs, Colo., presented a few ideas about how to render such potentially dangerous lakes harmless. Since lime reacts with carbon dioxide to form chalk, it could be added to a lake to take the carbon dioxide out of solution, he says. Stewart figures that a few thousand tons of lime would keep Lake Nyos safe for quite a while, but he adds that the cost of getting the lime to the lake would be very high. Another idea is to explode a small bomb in the deep waters of the lake, an approach Stewart says might get rid of most of the carbon dioxide for decades if not thousands of years. Both Stewart and Peter Kilham at the University of Michigan in Ann Arbor have also suggested bubbling air through the lake to carry out the carbon dioxide, in a method similar to that used in sewage ponds. The disadvantage of this idea, says Stewart, is that it requires some sophisticated technology.

Like other catastrophes, the Lake Nyos disaster has had its positive sides. As Paul Pondi, Cameroon's ambassador to the United States, commented at one AID meeting, it brought the world's attention to the democratic nation of Cameroon. It has also put limnology in the limelight.

And it has led volcanologists to a remarkable discovery. Devine says the team discovered pieces of peridotite — the primary material of the earth's mantle — up to the size of footballs at Lake Nyos. The finding of peridotites at the earth's surface is a rare occurrence, and usually the erupted chunks are no larger than walnuts. The minerals may hold clues to the Lake Nyos disaster — for example, Devine plans to look for fluid inclusions in olivine crystals that might help determine whether the mantle beneath Cameroon is rich in carbon dioxide or other gases. But the minerals will also be like a "magic submarine" for people studying the mantle, says Devine. "Lake Nyos would be famous even apart from the disaster," he says, "because of the abundance of peridotite brought to the surface." *— S. Weisburd*

Possible visitor from the Oort cloud

Cometary orbits are usually either elliptical or parabolic, and it is often difficult to predict them exactly from the first few observations. That of Comet Wilson, which was discovered Aug. 5 by Caltech graduate student Christine Wilson, appears to be parabolic. Up to Sept. 15, at least, calculations had shown no deviation from a parabola, says Brian Marsden, director of the International Astronomical Union's Central Bureau for Astronomical Telegrams in Cambridge, Mass.

A parabola indicates a long orbit. Comet Wilson may be a fresh visitor from the Oort cloud, a collection of cometary material surrounding the solar system a light-year away from the sun. If the comet repeats, it may take centuries or even millennia between returns to the inner solar system. Current calculations make its perihelion date April 20, 1987, when it should approach the sun almost as closely as the earth does (1.2 astronomical units).

Current observations put the comet's brightness at 10th or 12th magnitude, and with fingers crossed astronomers predict it may reach 3rd magnitude at perihelion. This would make it visible to the naked eye under fairly dark conditions, but mainly in the Southern Hemisphere.

If it is a fresh visitor from the Oort cloud, it may fizzle as Comet Kohoutek did in 1973, and for the same reason, Marsden says: Volatiles that now make it bright will have burned off, and, depending only on sublimation of water-ice for brightness, it could become much dimmer. On the other hand, if it breaks up, as Comet West did in 1976, it could provide a spectacular show, he says. Although Marsden hears that the press in New Zealand is already making a fuss about it, he stresses that Comet Wilson will probably be a workout for professional astronomers rather than a spectacle for pedestrians.

— D. E. Thomsen

Coated quartz for detecting toxics

Quartz crystals coated with proteins such as antibodies, enzymes and other biologically active materials may be useful for detecting traces of pesticides and drugs in air. This technique is potentially simpler and cheaper than currently available methods for recognizing and measuring small concentrations of toxic substances.

In the Sept 3 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, chemist George G. Guilbault of the University of New Orleans and his colleagues report success in using quartz crystals coated with antibodies against the pesticide parathion to measure parathion concentrations down to 36 parts per billion. "The results obtained in this study," the researchers say, "demonstrate that a piezoelectric crystal coated with a specific antibody could be used as an analytical tool in gas-phase analysis."

Each quartz crystal has two surface electrodes, which are coated with a specific agent known to bond with the substance to be measured. For example, parathion antibodies would pick up the antigen parathion. Normally, an electric current drives the crystal to oscillate at a set frequency. When an antigen-carrying gas flows over the crystal, the coated surfaces collect the antigen and as a result grow heavier. This weight increase changes the crystal's frequency, providing a measure of the antigen's concentration in air.

The researchers found that their antibody-coated crystals last for several weeks. Passing pure air over the used sensors reverses the antibody-antigen reaction and restores the crystals to their original state. The same frequency signal is observed before and after repeated exposure to antigen.

Although protein-coated quartz crystals have been used before to detect specific substances, those reactions have all taken place in liquids. The new results, says Guilbault, are the first to show that the analysis can be done directly in the gas phase. Guilbault has a small company that holds a patent on this technique.

Guilbault is now developing antibody-based sensors for detecting cocaine, morphine and heroin in air. These sensors, he says, would be able to detect levels that a dog's nose can sniff out. "But you don't have the upkeep and the mess that you have with dogs," says Guilbault.

However, the researchers say, while a great deal is known about antigen-antibody interactions in solution, much less is known about their behavior in the vapor phase. These aspects will have to be studied further before a practical sensor is ready. *— I. Peterson*