Huge Eruption May Cool the Globe

The eruptions of Unzen in Japan and Mount Pinatubo in the Philippines may have competed for space on front pages over the past few weeks, but in global terms there has been no match. At press time Unzen was still a minor rumble, but Pinatubo, at least in its atmospheric effects, appears to have set a modern record. Even the 1982 eruption of El Chichón in Mexico, which may have significantly depressed world temperatures, appears to have wreaked less havoc than Pinatubo now threatens, according to scientists monitoring the eruption cloud by satellite. "It's no Krakatoa," says Arlin Krueger of NASA's Goddard Space Flight Center in Greenbelt, Maryland. "But this is possibly the largest eruption of this century."

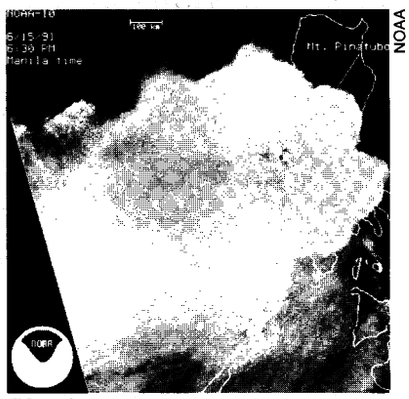
The enormity of Pinatubo's eruption has caught the attention of a lot of researchers. On the one hand, atmospheric scientists are delighted to study just how much a volcanic eruption can change climate. But there may also be a down side: For one thing, Pinatubo's ability to depress global temperatures may temporarily frustrate climatologists who are trying to detect any signal of greenhouse warming. And atmospheric chemists are facing the disquieting possibility that Pinatubo's eruption plume will take a serious bite out of stratospheric ozone.

The instrument that has taken the measure of Pinatubo's atmospheric effects is a workhorse of the stratospheric ozone community: the TOMS (Total Ozone Mapping Spectrometer) on the Nimbus-7 satellite. TOMS was not designed to look for volcanic clouds, but the massive amounts of sulfur dioxide from an eruption show up in TOMS measurements as interference in the ozone signal. From TOMS data, Krueger estimates very roughly that Pinatubo's streaming plume of debris contains 15±5 million tons of sulfur dioxide, about twice what TOMS found after El Chichón's eruption.

And it is the sulfur dioxide from a volcano, not the more spectacular clouds of ash, that is of particular interest to atmospheric scientists. Ash falls out of the atmosphere in weeks or months, but sulfur dioxide gas turns into tiny aerosol droplets of sulfuric acid—so small they linger in the stratosphere for 1 to 3 years.

The tiny droplets make an efficient sun shield. According to some recent studies, the sulfurous cloud from El Chichón blocked so much solar energy that Earth's surface cooled several tenths of a degree for a year or two (*Science*, 14 July 1989, p. 127). Pinatubo might be expected to have a similar or even greater influence. Its cooling could temporarily counteract decades of greenhouse warming, which has been at most only about 0.5°C during the entire 20th century.

Pinatubo's stratospheric cloud may also have an unfortunate chemical effect. David Hofmann and Susan Solomon of the National Oceanic and Atmospheric Administration in Boulder have calculated that the El Chichón aerosol could have catalyzed the destruction of as much as 15% of the stratospheric ozone in the middle latitudes of the Northern Hemisphere—a decline that would stand out sharply against the ongoing decline of 5% per decade in recent times. Much like cloud particles within the Antarctic ozone hole, the droplets in a volcanic cloud provide a surface that may hasten the reaction of ozone with manmade chlorine compounds. If this catalytic effect is as potent as Hofmann and Solomon believe it to be, Pinatubo will have a dramatic though temporary ozone-depleting effect.



Big shot. *A satellite infrared sensor caught the burgeoning cloud.*

Hofmann is anxious to start hunting for evidence supporting his and Solomon's calculations, but money is in short supply, he says. No one factored Pinatubo into fiscal year 1991 budgets, he notes, so everyone is scrambling to take advantage of this mammoth natural experiment.

■ RICHARD A. KERR

Whom Do Yew Trust?

Last week's headlines to the contrary, the yew fight continues. The major newspapers reported a pair of agreements that were touted as satisfying to opponents in a tussle that has pitted good guy against good guy. On one side are researchers and clinicians who want to harvest the bark of the yew, a rare tree growing in the Northwest United States. The bark produces taxol, a promising new anti-cancer drug. Environmentalists are sympathetic, but they also want to protect the old-growth forests where the yew trees thrive.

In agreements much ballyhooed last week, the Departments of Agriculture and Interior granted Bristol-Myers Squibb exclusive rights to harvest the yew trees and extract the taxol for drug testing. In return, the company agreed to sponsor ecological research on the yew tree. So everybody's happy, right? Well, not quite.

While some environmentalists are pleased, others, particularly in the Northwest, are critical, arguing that the monopoly granted to Bristol-Myers Squibb is not in the best interests of forests or cancer patients. "Monopolies as a rule are bad, and this is a case in point," says Wendell Wood of the Oregon Natural Resources Council. He and others say that the arrangement allows Bristol-Myers to continue using harvesting methods that waste much bark, and it would prevent other companies working on renewable extraction methods from having access to the trees.

Such access is crucial, the Wood camp maintains, because of the quantities of taxol that might be needed in the next few years. In National Cancer Institute (NCI) clinical trials, taxol helped one-third of ovarian cancer patients who had not responded to any other treatment. And it has shown signs of being effective against breast, lung, and other cancers. Merely to proceed with clinical trials, doctors need the bark of 38,000 yew trees annually. And if taxol ever becomes a standard drug, doctors might use five times that much. Needed, therefore, are methods of producing taxol without laying waste to the yew tree population.

NCI researchers and Bristol-Myers say they are looking for innovative approaches, and cite such possibilities as extracting it from the trees' needles or leaves, and synthesizing the complex molecule. But none of these methods will be ready for 4 or 5 years, the company says.

The Wood camp thinks the odds of creating more efficient methods would be improved if research was competitive. But officials at the NCI told *Science* that concerns about monopoly miss the main point—health. "People are dying right now who need the drug," says NCI's director of cancer treatment Bruce Chabner. "This arrangement will ensure that patients have the best chances of getting the needed treatment."

So the taxol debate rages on. Its next venue: Congress. On 29 July, Representative Ron Wyden (D–OR) plans a hearing on the issue.

■ ROBERT LANGRETH