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COVER: A tornado as seen by Doppler radar. This next generation of weather radar — which uses color displays to indicate such things as strength, velocity and direction of severe weather — is expected to provide early and accurate severe-weather warnings. See story p. 360. (Photo: NSSL)

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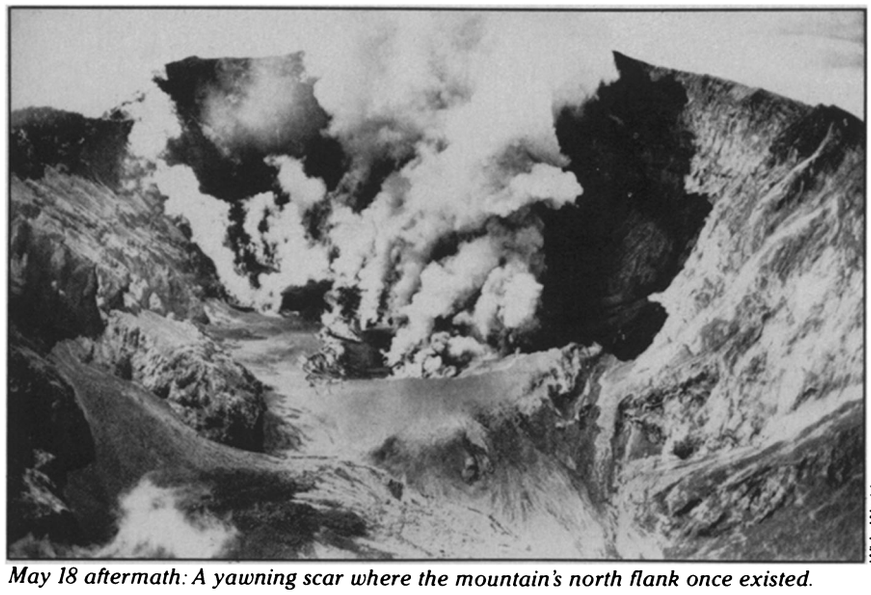
SCIENCE NEWS OF THE WEEK

In the Wake of Mt. St. Helens



Wide World

May 18 aftermath: A yawning scar where the mountain's north flank once existed.

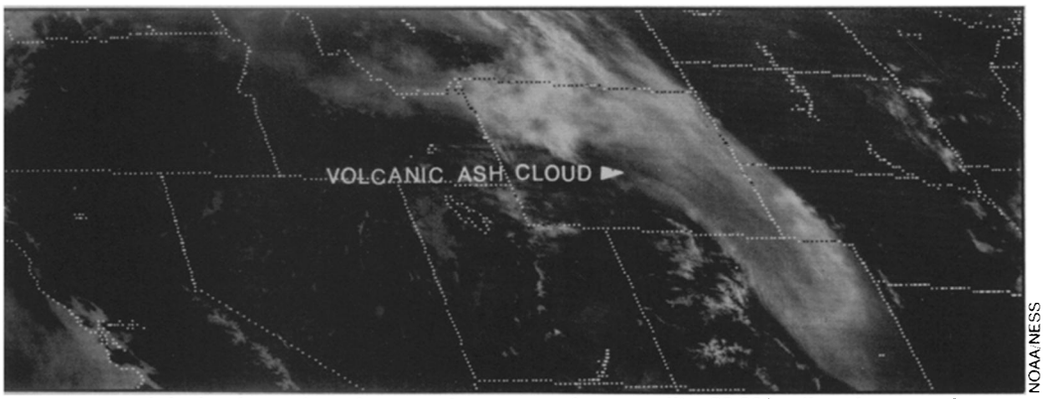
As ash from the devastating May 18 eruption of Mt. St. Helens completed its first world tour last week, some scientists began looking for signs of an end to the volcano's fury, while others turned to the multitude of indirect effects of the largest volcanic explosion in North America since 1912.

First reports of signs of an end to the destructive eruptions had to be retracted last week. Glowing red spots were detected in the crater early May 29 by airborne observers using light intensive binoculars. The spots were interpreted by geologists as lava flows — molten rock finally rising through the volcanic "pipe" from great depths. The quiet formation of a lava dome in the crater was just what the geologists were waiting for; it would signal that the heated, bottled-up gases had been released — at least for several more decades — and that the lava would just ooze out without further explosions. Some gas might build up under the cooling lava and blow out from the sides, they said, but not with the force of the May 18 and the smaller May 25 blasts. The mountain would rebuild itself by forming a lava dome, like putting putty in the 1-kilometer-by-2-kilometer scar on its north flank, and would go back to sleep for another hundred years. But wishing didn't make it so. No topographic or visual evidence could be found for a lava dome or lava flows and scientists backed off, saying that the glows could be from rocks heated from beneath.

In the meantime, other scientists were riffling the pages of record books, trying to get a fix on Mt. St. Helens's vital statistics. Basing their estimate on the acoustic pressure wave detected in Boulder, Colo., and Washington, D.C., the National Oceanic and Atmospheric Administration judged the May 18 explosion to be equal to about ten million tons (megatons) of TNT — about 500 times as powerful as the Hiroshima bomb. Lester Machta of NOAA's Air Resources Laboratories said the estimate was made by comparing the pressure signal with similar signals for distant nuclear explosions of known magnitude.

Based on the dimensions of the maw that is left on the north flank — about 1 km wide, 2 km long and 0.3 km deep — the U.S. Geological Survey estimates that about 1 cubic kilometer of ash and rock was thrown from the volcano. That puts the Mt. St. Helens eruption in the same ballpark as the Vesuvius eruption that buried Pompeii in 79 A.D. and, according to Tom Simkin of the Smithsonian Institution, makes it a "once in a decade" volcano. Eruptions of similar size occurred in Kamchatka, a peninsula of northeastern Siberia, in 1975, 1964 and 1955, he said.

All that stuff floating around also makes the volcano a once in a decade chance for atmospheric scientists. According to Bill Sedlacek of Los Alamos Scientific Laboratory, the material that entered the troposphere (up to about 13 km) has already circled the globe once and re-entered the United States on June 2. Because of the volcano's location and the time it chose to erupt, it will have more effect on the upper atmosphere (stratosphere) — and therefore on Northern Hemisphere climate — than have other similar eruptions, he says. The lower limit of the stratosphere is nearer the ground at the latitude of Mt. St. Helens, and immediately after the eruption, the stratospheric winds made a seasonal reversal and began blowing toward



NOAA NESS

Ash cloud one day after eruption as seen from satellite 22,000 miles above earth.

the west. As a result, the stratospheric ash traveled east to Colorado, made a U-turn and returned over Washington by May 27.

On the ground, researchers are also taking stock of Mt. St. Helens's aftermath. The Forest Service estimates that one billion board feet of timber was leveled by the eruption, although a spokesman said much could be salvaged. One report estimated that 5,250 elk, 6,000 deer, 200 bear, 100 mountain goats, 15 cougars and thousands of small animals were lost; crop damage in Washington state is estimated at more than $100 million. □

Rocks and shocks in the Sierras

Campers and hikers in the region certainly thought differently, but the recent batch of earthquakes in the Mammoth Lakes, Calif., area of the Sierra Nevada range came as no surprise to researchers at the University of Nevada in Reno. Alan Ryall and co-workers had just expanded their network of instruments in the area; Ryall had presented a paper in April describing the area as ripe for a large quake. But the series of tremors — which began on May 25 with two Richter magnitude 6.0 quakes, followed by a third magnitude 6.0 on May 27 and more than 100 quakes measuring 4 or larger — is definitely not typical of California-style shakers.

The rash of temblors is typical of that region, however, explained Ryall. Similar sequences occurred in 1941 and 1927 and, of late, he said in an interview, the region had shown signs of building toward something as big as a magnitude 6.0 — which is considered capable of severe damage. Beginning in 1978, the Nevada researchers noted a growing number of moderate quakes (magnitudes 4 to 5.5) along a 200-mile stretch of the eastern edge of the Sierras, from Reno south to Bishop, Calif. (Mammoth Lakes lies about 40 miles north of Bishop and about 200 miles east of San Francisco; the recent activity is tentatively fixed about 7 to 8 miles east and south of the town.) Ryall and co-workers, as well as seismologists from other institutions, also noted "swarms" — or clusters of small quakes — in the area since last September.

Such activity — scattered moderate quakes and swarms, all in a reasonably confined area — is custom-made grist for the earthquake prediction mill. Accordingly, early this year Ryall and co-workers expanded their network of seismographs with funding from the U.S. Geological Survey's earthquake prediction program. In April, Ryall told a seismology meeting that the recent activity added up to a good possibility of a large quake — maximum magnitude 7.5 — somewhere between Mammoth Lakes and Bridgeport, 50 miles to the north. "I didn't make a prediction," Ryall stresses. "It's just that there was such a similarity between the pattern here and other areas [such as before] the 1971 San Fernando earthquake .... It was really obvious based on a lot of experience and a good overview of the earthquakes in that area." As for the possibility of another, larger quake in the area: "I wouldn't be surprised if it did and I wouldn't be surprised if it didn't."

The recent events also serve to show seismologists another of the many personalities of temblors. According to Cal Tech's Clarence Allen, the Mammoth Lakes quakes are a different breed from other California earthquakes. The August 1979 and January 1980 quakes in the San Francisco area, for example, consisted of an abrupt major shock and a series of aftershocks that declined in intensity, he said. In southern California, as in the October 1979 Imperial valley quake, swarm activity builds gradually to a peak — the main shock — and tails off. "This [the Mammoth Lakes series] is in between," says Allen. "It's like the back end of a swarm. It started abruptly — started high and stayed high. It's like a truncated swarm."

Despite their personality clashes, these various seismic events are beginning to be viewed by some seismologists as part of a large-scale phenomenon. "There is an increase in the earthquake rate in California." says Cal Tech's Kate Hutton. "It's possible it could be due to tectonic changes at depth — to large-scale changes in the stress field. But we have no mechanism; it's speculative right now." □

Love Canal: Where does DOD fit in?

The New York State Assembly may have thrown a monkey wrench into Justice Department suits (SN: 1/5/80, p. 6) charging Hooker Chemical Co. and related parties with contaminating four Niagara Falls sites, including the one known as Love Canal. Preliminary findings of an inquiry the assembly commissioned June 1, 1979 last week reported finding evidence that the federal government might also be implicated in the contamination of parts of Niagara County, N.Y., including a region of Love Canal.

What the State Assembly report claims to have found is evidence: that the federal government engaged in extensive wartime and post-war manufacturing of munitions, nuclear materials and items of chemical warfare in the Love Canal region; that hazardous and toxic chemicals were disposed of improperly and without regard to the potential dangers they might present to the health and safety of persons who then and might later live in the area; and that the government transferred parcels of dangerously contaminated property to private companies.

On May 30, one day after the State Assembly report was issued in Albany, the Department of Defense issued its own statement categorically denying the charges: "The Department of Defense takes exception to the New York State Assembly task force report as we find no evidence to suggest that previous, comprehensive army and interagency task-force reports — which found no Defense Department dumping program existed in the Love Canal area — were deficient." In fact, the report "presents a very weak case of federal culpability," DOD said.

Whether or not one would term it weak, the State Assembly report does indeed make a case for DOD involvement at Love Canal beyond what had been admitted previously. For example, the "comprehensive army report" mentioned in the DOD statement was published in August 1978. According to the report, the army did not produce phosgene — a chemical warfare agent — at Niagara Falls either during or after World War II, nor did it ship chemical warfare materials in military vehicles. Yet the State Assembly report turned up formerly classified military documents showing wartime production of phosgene at two Niagara Falls sites together with requests for the army to ship the chemical in its own vehicles.

Among the phosgene manufacturing plants was a Hooker Electrochemical Co. site. Documents studied by Arthur James Woolston-Smith, a State Assembly investigator, explained that Metals Reserve Co., a subsidiary of the federally owned Reconstruction Finance Corp., had constructed facilities on a Hooker Elec-