

Earth's Temperature Has Dropped a Little After a Warm Spell

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THE earth's climate appears to be entering a new phase.

After a record warming in 1990, the average temperature of the globe has dropped slightly in 1991, thanks to a moderating trend that began in the early fall.

Climatologists say the trend could be the start of a cooler period that they expect will result as sunlight is blocked by haze thrown into the atmosphere by the eruption last June of the Mount Pinatubo volcano in the Philippines.

New calculations suggest that the haze will cause a dramatic global cooling whose full force will be felt in late 1992, raising the odds in favor of colder winters and cooler summers until about the middle of this decade. After that, the calculations suggest, the warming of the 1980's will resume.

But how the weather will develop in any given region or locality in any given season during the time of volcanic cooling is subject to a welter of natural, interacting atmospheric forces that can overwhelm any longer-term global tendency. Scientists say that one of the most powerful of those weathermakers is now coming into play. El Nino, the huge pool of extra warm seawater that periodically appears in the eastern part of the tropical Pacific Ocean, has returned and is poised to set off a chain of atmospheric events that scientists expect will affect the weather in many parts of the world, including the United States.

While El Nino's effects this time are expected to be milder than in 1982 and 1983, scientists say they will be noticed nonetheless. In 1982-83, sea-surface temperatures even higher than current ones pumped more energy into the atmosphere, touching off a climatic chain reaction that brought disastrous drought to some parts of the world and flooding rains to others.

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In the Southern Hemisphere summer now beginning, Australia and Indonesia are expected to be drier than normal, but not so dry as nine years ago. The Indian monsoon could be weaker than normal if El Nino persists into the middle of next year. The Eastern Pacific and the northwest coast of South America could be rainier.

In the United States, experts say, El Nino will probably change jet stream patterns so as to make this winter an extra wet and stormy one in the Southeast and raise the risk that big snowstorms will develop in the East Coast latitudes around Washington. They say the risk is also a little higher than normal, though not so high as around Washington, along the coast north of there.

Apart from the changes in atmospheric circulation that El Nino touches off, it exerts a general but temporary warming effect on the earth's climate. This time, climatologists believe, the effect will be smothered by the cooling caused by Mount Pinatubo's volcanic haze. The haze is also expected to offset, temporarily, whatever global warming might be taking place as a result of heat-trapping gases like carbon dioxide that build up in the atmosphere largely as a result of the burning of fossil fuels like coal and oil.

While the global climate has warmed by nearly one degree Fahrenheit in the last century, most scientists say it is too early to tell whether the warming has been caused by the heat-trapping gases or by natural factors.

Climatologists almost to a person have been saying that the global haze of tiny droplets of sulfuric acid and water produced by Mount Pinatubo's gaseous cloud will exert a marked cooling effect on the planet. Now one of them, Dr. James E. Hansen of the NASA Goddard Institute of Space Studies in New York, has attempted to calculate its magnitude and timing.

Editors' Picks

He reported this month that based on a computerized simulation of the global climate, he had placed the expected cooling at about 1 degree Fahrenheit -- about enough to cancel out, temporarily, the global warming that has taken place in the last 100 years. It is also more than enough to override the four-tenths of a degree of global warming caused by a typical El Nino event. Bad News for Moscow

The one-degree cooling predicted by Dr. Hansen is expected by the end of next year. By way of comparison, the earth has warmed by about 9 degrees since the end of the last ice age. The main impact of the cooling, he said in a talk at a meeting of the American Geophysical Union in San Francisco two weeks ago, will be to delay by several years the time when global warming caused by the increase in heat-trapping gases becomes obvious. Dr. Hansen has argued that the recent warming was probably caused by the growing accumulation of heat-trapping gases.

Dr. Hansen's mathematical model also calculated that volcanic cooling will about double the chances of an unusually cold winter in Moscow in each of the next three years and that it will cut in half the chances of an unusually hot summer in Omaha. It

also estimated that the cooling would delay the blooming of cherry blossoms in Washington and Tokyo by about a week.

Elaborate mathematical models of the global climate are considered approximate at best, and they are generally considered poor at making such precise estimates about specific localities. Dr. Hansen himself acknowledges the models' imperfections. There are six such global models in the world, but Dr. Hansen's is believed the only one so far to calculate the effect of the Mount Pinatubo eruption. The volcano, he said, has provided a "great test case" of the models' predictive ability.

So far, the unfolding story has not contradicted the Hansen model. The model predicted that the cooling would begin in late 1991, and that has happened -- although no one, including Dr. Hansen, is prepared to say at this stage whether Mount Pinatubo or natural variability is responsible.

Last year was the warmest since people began keeping records of the earth's surface temperature in the late 19th century, according to independent analyses of separate sets of data made by Dr. Hansen and by a British team headed by Dr. Phil Jones of the University of East Anglia and David Parker of the British meteorological office.

Both Dr. Hansen and Dr. Jones said that 1991 would undoubtedly fall short of the 1990 record, which pegged the average surface temperature of the globe at just under 60 degrees. Through the first 11 months, Dr. Hansen said, 1991 was the second warmest year, and he said that the volcano haze makes it "extremely improbable" that December would enable it to overtake 1990. Dr. Jones said 1991 would probably rank from second to fourth warmest.

Two other sets of American data, one derived from instruments carried aloft by balloons and the other from satellite observations, show that the atmosphere cooled after August. Until September, 1991 was as warm as 1990, said Dr. James K. Angell of the National Oceanic and Atmospheric Administration's Air Resources Laboratory in Silver Spring, Md., who analyzed the balloon data.

But since then, he said, 1991 has been cooler than 1990. Likewise, 1991 "has been cooling off faster than average," said Roy Spencer of the NASA Marshall Space Flight Center in Huntsville, Ala., who analyzed the satellite data.

Similarly, the United States as a whole became cooler in the latter part of the year. Through August, 1991 was the nation's sixth warmest year on record, said Richard Heim, a meteorologist at the National Climatic Data Center at Asheville, N.C. But cooler autumn temperatures brought it down to 11th warmest, measured through November.

There were regional differences within this overall national picture, however. The Northeast, for instance, experienced one of its warmest years ever through November, with a number of states in the region living through their second or third warmest years on record. But even in the Northeast, the latter part of the year cooled off: autumn in the region was the 57th coolest in 97 years of records.

In New York, meteorologists expect 1991 to rank easily as one of the 10 warmest years on record.

The Northeastern warmth resulted largely from a persistent high pressure system off the East Coast that deflected arctic air out over the North Atlantic last winter, and from another high pressure system that settled in over the Northeast in spring, bringing warm, dry conditions, said Jim Wagner, senior forecaster in the prediction branch of the National Weather Service's Climate Analysis Center at Camp Springs, Md.

The analysis center says the odds favor a warmer than normal winter for the Northeast this year, largely because a stronger-than-normal high pressure system in southern Canada is expected to block any major invasions of arctic air. But the chain of events set off by El Nino raises the possibility of more snowstorms for the region, Mr. Wagner said, although they are not guaranteed.

While the change in atmospheric circulation set off by El Nino is likely to make the South stormier and damper, he said, there is no proven connection between El Nino and increased California rainfall. For most of the state, he said, the winter is expected to be mild, with uncertain prospects for rain.

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