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From China Cause
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One tainted export from China can't be avoided in North America -- air.

An outpouring of dust layered with man-made sulfates, smog, industrial fumes, carbon grit and nitrates is crossing the Pacific Ocean on prevailing winds from booming Asian economies in plumes so vast they alter the climate. These rivers of polluted air can be wider than the Amazon and deeper than the Grand Canyon.

"There are times when it covers the entire Pacific Ocean basin like a ribbon bent back and forth," said atmospheric physicist V. Ramanathan at the Scripps Institution of Oceanography in La Jolla, Calif.

On some days, almost a third of the air over Los Angeles and San Francisco can be traced directly to Asia. With it comes up to three-quarters of the black carbon particulate pollution that reaches the West Coast, Dr. Ramanathan and his colleagues recently reported in the Journal of Geophysical Research.

This transcontinental pollution is part of a growing global traffic in dust and aerosol particles made worse by drought and deforestation, said Steven Cliff, who studies the problem at the University of California at Davis.

Aerosols -- airborne microscopic particles -- are produced naturally every time a breeze catches sea salt from ocean spray, or a volcano erupts, or a forest burns, or a windstorm kicks up dust, for example. They also are released in exhaust fumes, factory vapors and coal-fired power plant emissions.

A satellite view from 2001 shows dust arriving in California from Asian deserts. Concentrations of dust are visible to the south, near the coastline (lower right); To the west the dust is mixed with clouds over open ocean. This dust event caused a persistent haze in places like Death Valley, California, where skies are usually crystal clear.

Over the Pacific itself, the plumes are seeding ocean clouds and spawning fiercer thunderstorms, researchers at Texas A&M University reported in the Proceedings of the National Academy of Sciences in March.

The influence of these plumes on climate is complex because they can have both a cooling and a warming effect, the scientists said. Scientists are convinced these plumes contain so many cooling sulfate particles that they may be masking half of the effect of global warming. The plumes may block more than 10% of the sunlight over the Pacific.

But while the sulfates they carry lower temperatures by reflecting sunlight, the soot they contain absorbs solar heat, thus warming the planet.

Asia is the world's largest source of aerosols, man-made and natural. Every spring and summer, storms whip up silt from the Gobi desert of Mongolia and the hardpan of the Taklamakan desert of western China, where, for centuries, dust has shaped a way of life. From the dunes of Dunhuang, where vendors hawk gauze face masks alongside braided leather camel whips, to the oasis of Kashgar at the feet of the Tian Shan Mountains 1,500 miles to the west, there is no escaping it.

A satellite image from 2005 shows a plume of dust flowing from China to the north of the Korean Peninsula and over the Sea of Japan. Such plumes can cross the Pacific and scatter dust across the Western U.S.

The Taklamakan is a natural engine of evaporation and erosion. Rare among the world's continental basins, no river that enters the Taklamakan ever reaches the sea. Fed by melting highland glaciers and gorged with silt, these freshwater torrents all vanish in the arid desert heat, like so many Silk Road caravans.

Only the dust escapes.

In an instant, billows of grit can envelope the landscape in a mist so fine that it never completely settles. Moving east, the dust sweeps up pollutants from heavily industrialized regions that turn the yellow plumes a bruised brown. In Beijing, where authorities estimate a million tons of this dust settles every year, the level of microscopic aerosols is seven times the public-health standard set by the World Health Organization.

Once aloft, the plumes can circle the world in three weeks. "In a very real and immediate sense, you can look at a dust event you are breathing in China and look at this same dust as it tracks across the Pacific and reaches the United States," said climate analyst Jeff Stith at the National Center for Atmospheric Research in Colorado. "It is a remarkable mix of natural and man-made particles."

This spring, Dr. Ramanathan and Dr. Stith led an international research team in a \$1 million National Science Foundation project to track systematically the plumes across the Pacific. NASA satellites have monitored the clouds from orbit for several years, but this was the first effort to analyze them in detail.

For six weeks, the researchers cruised the Pacific aboard a specially instrumented Gulfstream V jet to sample these exotic airstreams. Their findings, to be released this year, involved NASA, the National Oceanic and Atmospheric Administration and nine U.S. universities, as well as the National Institute for Environmental Studies in Japan, Seoul National University in Korea, and Lanzhou University and Peking University in China.

The team detected a new high-altitude plume every three or four days. Each one was up to 300 miles wide and six miles deep, a vaporous layer cake of pollutants. The higher the plumes, the longer they lasted, the faster they traveled and the more pronounced their effect, the researchers said.

Until now, the pollution choking so many communities in Asia may have tempered the pace of global warming. As China and other countries eliminate their sulfate emissions, however, world temperatures may heat up even faster than predicted.

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