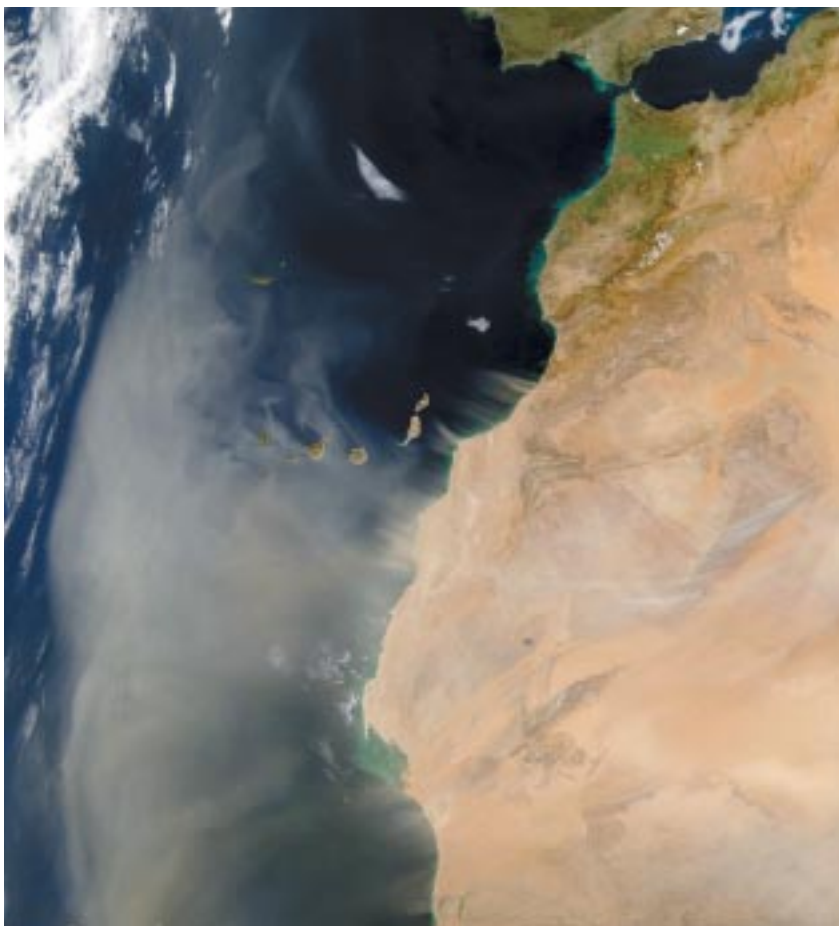


Disease Dustup

DUST CLOUDS MAY CARRY INFECTIOUS ORGANISMS ACROSS OCEANS BY OTTO POHL



SANDSTORM blows particulates out from Africa's Sahara Desert (right) over the Canary Islands in the Atlantic Ocean. The storm occurred in February 2001.

On February 11, 2001, an enormous cloud of dust whipped out of the Sahara and moved north across the Atlantic, reaching the U.K. two days later. A few days afterward, counties across the northern part of the island began reporting simultaneous outbreaks of foot and mouth disease, a viral sickness of livestock (sometimes confused with mad cow disease). For Eugene Shinn, a geologist at the U.S. Geological Survey in St. Petersburg, Fla., that coincidence suggested an obvious link.

The idea that large-scale disease outbreaks could be caused by dust clouds from other continents has been floating around for years. But it seemed far-fetched. In the U.S. government, “no one wanted to listen to me,” Shinn remembers about his proposal that something as amorphous and uncontrollable as a dust cloud could bring the disease to America.

But the theory is now gaining acceptance as scientists find that it may explain many previously mysterious disease outbreaks. Although the world's dry areas have always shed dust into the atmosphere—wind blows more than a billion tons of dust around the planet every year—the globe's dust girdle has become larger in recent years. Some of the changes are part of nature's cycles, such as the 30-year drought in northern Africa. Others, including the draining of Lake Chad in Africa and the Aral Sea in Central Asia, are the result

LEAVING DDT
IN THE DUST

Dust carries more than just disease. Ginger Garrison of the U.S. Geological Survey suspects that DDE, a breakdown product of DDT and a dangerous endocrine disruptor, is blowing over from Africa to the Caribbean. She is currently analyzing dust samples from Mali, the Caribbean, and the middle of the ocean. She has also visited Mali to track the source of these toxic dust-borne chemicals. "There has been a definite change in what goes into the air in West Africa," she says. "In the past 12 to 15 years, there has been an incredible increase in the use of pesticides and plastics incineration."

of shortsighted resource management. Poor farming practices also hasten desertification, creating dust beds polluted with pesticides and laced with diseases from human and animal waste.

For Shinn and his co-workers, it was a strange disease outbreak in the Caribbean in the late 1970s that first brought to mind the connection between dust and disease. A soil fungus began to attack and kill seafan coral. The researchers doubted that local human activity was the culprit, because the disease was found even in uninhabited places and islands devoid of soil. In addition, Garriet W. Smith of the University of South Carolina demonstrated that because the soil fungus could not multiply in seawater, it required a constant fresh supply to continue spreading.

Smith analyzed the African dust blowing across the Caribbean and was able to isolate and cultivate the soil fungus *Aspergillus sydowii*, with which he then infected healthy seafans. Investigators at the USGS then showed how the *Aspergillus* fungus and other organisms could survive the long trip from Africa protected by dense clouds of dust.

Researchers are now finding evidence that supports the link between sickness and dust. Ginger Garrison of the USGS believes that

there is a direct link between bacteria-caused coral diseases such as white plaque and black-band disease and African duststorm activity. In addition, outbreaks of foot-and-mouth disease in South Korea last year have followed large duststorms blowing in from Mongolia and China.

Other organizations are now joining the USGS in tracking dust. NASA has satellites that are carefully monitoring dust storms, which can cover an area as large as Spain. The National Oceanic and Atmospheric Administration has just opened a station in California to track Asian dust as it passes over the U.S. (Although the SARS virus could theoretically cross oceans in a dust storm, the epidemiology so far indicates that person-to-person contact is the only way SARS has spread.)

The findings on international dust storms have also attracted the attention of those who are concerned about bioterrorism. "Anthrax will certainly make the trip" in dust from Africa to the U.S., remarks Shinn, who recently completed a terrorism risk assessment for the U.S. Dust clouds could be considered, in effect, a very dirty bomb.

Otto Pohl is based in Berlin.

ASTROPHYSICS

Frozen Stars

BLACK HOLES MAY NOT BE BOTTOMLESS PITS AFTER ALL BY GEORGE MUSSER

Demolishing stars, powering blasts of high-energy radiation, rending the fabric of spacetime: it is not hard to see the allure of black holes. They light up the same parts of the brain as monster trucks and battle bots do. They explain violent celestial phenomena that no other body can. They are so extreme, in fact, that no one really knows what they are.

Most researchers think of them as microscopic pinpricks, the remnants of stars that have collapsed under their own weight. But over the past couple of years, a number of mavericks have proposed that black holes are actually extended bodies, made up of an exotic state of matter that congeals, like a liq-

uid turning to ice, during the collapse. The idea offers a provocative way of thinking about quantum gravity, which would unify Einstein's general theory of relativity with quantum mechanics.

In the textbook picture, the pinprick (or singularity) is surrounded by an event horizon. The horizon is not a physical surface, merely a conceptual one, and although it marks the point of no return for material plummeting toward the singularity, relativity says that nothing special happens there; the laws of physics are the same everywhere. For quantum mechanics, though, the event horizon is deeply paradoxical. It allows information to be lost from our world, an act that