NEWS RELEASE

NCAR News Release

2003-26 **FOR IMMEDIATE RELEASE:** July 15, 2003

African Dust Brings Drought, Rain across Atlantic

BOULDER—Dust from the Sahara Desert in Africa may modify clouds and rainfall both in Africa and across the tropical North Atlantic as far away as Barbados, according to a study that uses data from NASA satellites, ground measurements, and computer models. Natalie Mahowald, a scientist at the National Center for Atmospheric Research (NCAR) and University of California, Santa Barbara, and Lisa Kiehl, a graduate student at UCSB, published their findings in a recent issue of Geophysical Research Letters.

The dust particles act as surfaces, or kernels, for water vapor to attach to in low clouds, and for ice crystals to form around in higher clouds.

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"The interaction between clouds and aerosols is critical for understanding climate change," says NCAR's Mahowald. Clouds play a pivotal role in reflecting and absorbing the Sun's rays, as well as radiation emitted from Earth's surface. The dust and cloud interplay also helps explain rainfall patterns over the Sahara Desert and areas to the south.

This is the first long-term regional study to confirm observations that mineral aerosols (dust particles in the air) can act as kernels for precipitation to form around. It is also the first to suggest that African dust interacts with clouds over a large region. NASA funded the study in cooperation with the National Science Foundation, NCAR's primary sponsor.

In low clouds, such as cumulus and stratocumulus, near the Sahara Desert, water attaches to dust particles. Higher dust concentrations can suppress rainfall and enhance drought conditions by dispersing water among many dust particles. This prevents the droplets from becoming heavy enough to fall, resulting in more thin, low clouds and less rain.

In high clouds, such as cirrus, cirrostratus, and deep convective clouds, there is some evidence that dust particles over wetter regions south of the desert provide surfaces for ice crystals to form around. The crystals grow rapidly, drawing moisture from surrounding cloud droplets. They become heavier and eventually fall, generating more rain and reducing the total amount of high clouds.

Dust from North Africa, where the desert lies, has blown increasingly into the atmosphere since the 1960s. Though the reasons for this are not clearly understood, some scientists believe the increase may be linked to human activity.

The researchers used 16 years of monthly mean observations from satellites, ground stations, and computer models to look at the relationship between cloud properties and mineral aerosols. They found a positive correlation between low-altitude cloud amounts and dust at the coast of North Africa, which supports the theory that dust particles act as sites for water droplets to form around in thin, low clouds.

The researchers also found a negative correlation between high clouds and dust along the equator across North Africa and the Atlantic Ocean. That is, more dust creates heavy ice particles in high clouds that rain down and ultimately reduce high cloud amounts. Still, since there are no long-term ground measurements for dust and high clouds in these areas, and because it has been hard to measure these high clouds with satellites, it is difficult to make firm conclusions regarding high clouds, rainfall, and ice forming around dust kernels.

Data on the number and thickness of the clouds, and cloud top pressure and temperature, came from NASA's International Satellite Cloud Climatology Project (ISCCP). ISCCP data covered 1984 to 1999 and combined Advanced Very High Resolution Radiometer (AVHRR) data from three satellites created and launched by NASA, including GOES-8, GOES-10, and GOES-12.

The study also used data from the Total Ozone Mapping Spectrometer (TOMS) instrument to determine the amount of radiation being absorbed by aerosols between 1984 and 1990. Data from the ground in Barbados was collected by scientists at the University of Miami.

NASA's Earth Science Enterprise is committed to studying the primary causes of the Earth system variability, including both natural and human-induced causes. Geophysical Research Letters is a publication of the *American Geophysical Union.*

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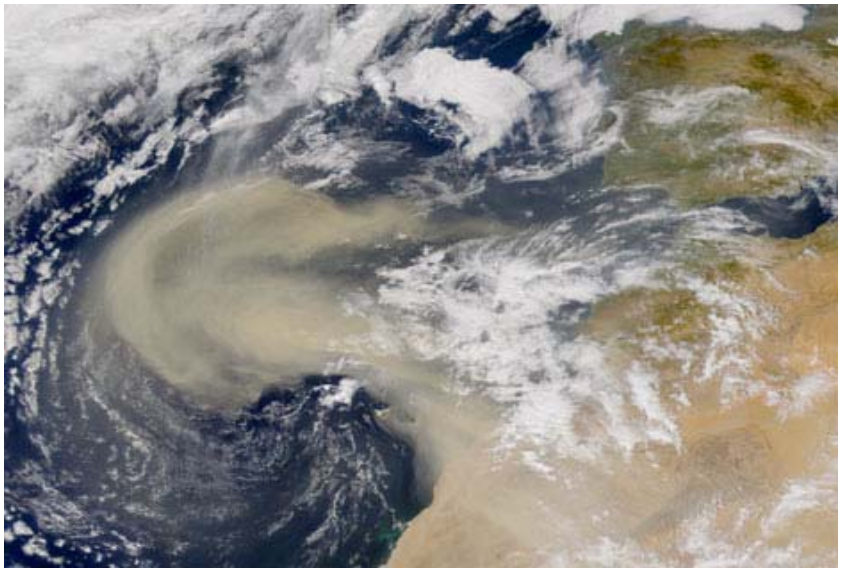

A large dust cloud heads east over the Atlantic Ocean from the West Coast of Africa on February 26, 2000. (SeaWiFS satellite image courtesy of NASA.)

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Last revised: Wednesday, July 16, 2003 11:30 AM