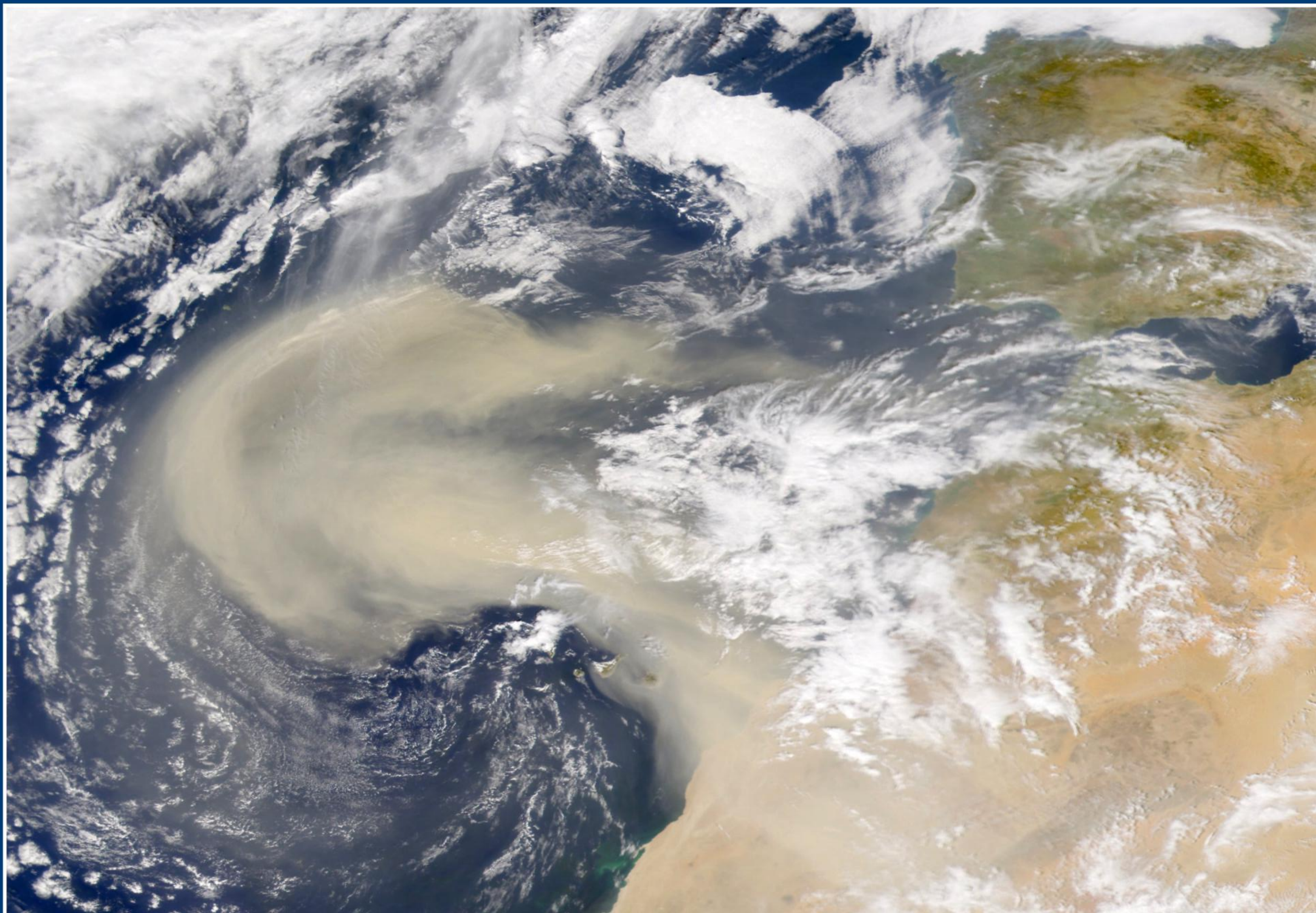
Saharan Dust Storm, February 26, 2000



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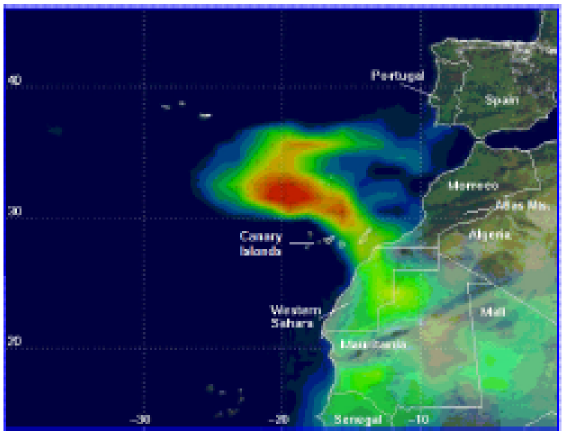
Saharan Dust Storm

Location: West Coast of Africa, Canary Islands, and Azores
Date: February 26, 2000
Image Source: NASA's SeaWiFS (Sea-viewing Wide Field-of-view Sensor)
Inset Image: TOM (Total Ozone Mapping Spectrometer)



Dust Storms

Dust and other fine particles have been moving across the Earth as long as winds have existed. However, only recently has remotely sensed imagery become available that captures the movement of dust. North Africa has the highest occurrence of dust storms. Dust is sent eastward across the Middle East, northward over the Mediterranean and Europe, and westward across the Atlantic to the Americas. These storms are not a new phenomenon. During his voyage on the Beagle, Charles Darwin recorded heavy dust coming from the west coast of North Africa. He even speculated on the impact of heavy dust deposits on the composition of the Atlantic Ocean. Today, satellite imagery illustrates the actual magnitude and areal coverage of these storms.

Dust From Africa

On February 26, 2000 a massive dust storm, captured by satellite, blew off the northwest African desert blanketing hundreds of thousands of square miles of the eastern Atlantic Ocean with a dense dust cloud that originated in the Sahara-Sahel region. Extending out from Western Sahara, this storm reached over 1000 miles into the Atlantic Ocean and penetrated deeply into cloud formations redirecting the normal wind flows. The storm came south of the Atlas Mountains across the flat, open lands of Western Sahara where the topography was less likely to hinder its movement. The clouds immediately north of the storm's neck extending back to the Atlas Mountains illustrate where the cloud banks along the northwest coast of Africa would have been if the storm had not pushed them out over the Atlantic. If the mountains were not present, the storm would have been more powerful. The Canary Islands were covered by the storm but the islands' higher elevations partially thwarted the storm flow, indicating that some of the dust in the storm was down at a low altitude.

The location image, recorded by the TOMS (Total Ozone Mapping Spectrometer) optical sensor, offers a rather unique view of the storm. The green to red false colors in the dust plume represent increasing amounts of aerosol, with the densest portion over the ocean. Under the densest portions of the plume (red) the amount of ultraviolet (UV) sunlight is reduced to half its normal value, while over the land (green) the UV sunlight is reduced by about 20 percent.

Desert winds vibrate sand particles to break them loose from other materials and toss the particles into the air for short distances. The heavy sand particles drop and in striking the ground loosen smaller particles of dust that can be suspended in air and carried great distances. Dust storms form primarily during the summer and winter months in the Sahara-Sahel region when temperature variations with surrounding land and water regions are at their greatest, creating strong wind conditions. Millions of tons of dust rise up from the region and float across the Atlantic Ocean within a few days. When hot desert air collides with the cooler, dryer air, winds form to lift dust into the air. As particles swirl upwards, strong trade winds blow them west into the North Atlantic. These storms are extremely dry, cover a large area, have strong winds, absorb heat, and prevent cloud formation.

Twenty percent of the dust from a single storm is carried out over the Atlantic Ocean, and twenty percent of that, or four percent of a storm's dust, reaches the Americas. Even with such a low percent, the amount of dust measures in the millions of tons. In July 2000, the Puerto Rico Dust Experiment (PRIDE) recorded almost 8 million tons of African dust reaching Puerto Rico within a one month period.

Sub-Saharan Drought

A long-term drought has dominated North Africa particularly in the southern Sahara and Sahel regions since the early 1970s. Before the drought, the Sahel region had a semiarid landscape covered in grassland and savanna with areas of woodland and shrub. This drought has reduced greatly the Sahel's vegetation coverage, and the remaining plants and soil are subjected to high rates of evapotranspiration. Much of this land has been transformed into an arid environment with sandy surfaces. During this drought local farmers have shifted away from large grazing animals such as cattle and camels and moved toward browsing animals namely goats and sheep that consume woody plants, leaving little vegetation to hold the soil in place. In addition to introducing browsing animals, farmers have increased irrigation demand on the three rivers that feed Lake Chad. Over the last fifty years the lake has steadily decreased in size, leaving a major source of windblown dust. Over farming, over grazing, and over population of marginal lands have added to the desertification of the region. Thus, a combination of physical and human events has prepared the stage for an increase of dust storms originating from the Sahel.

Interpretive Learning…

1) Identify the other major desert regions in the World and discuss which one(s) have dust that reaches the United States. A world atlas might help in dealing with identifying the deserts.
2) Discuss what people living in the Sahel might do to reduce the desertification of the region such as the use of solar energy for heating and cooking rather than burning wood from trees and bushes.
3) Describe conditions that created the Great Dust Bowl in the United States. Use this information to compare with the conditions of a Saharan Dust Storm.

Explore More…

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Acknowledgements:

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