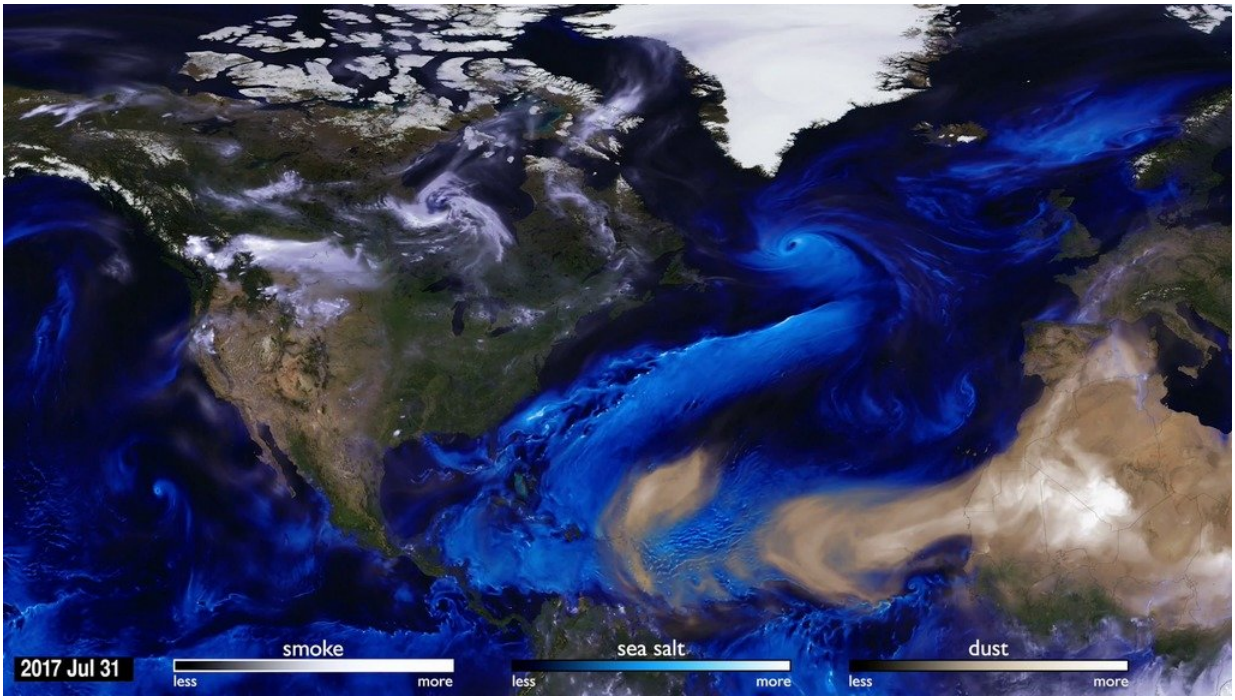
2017 hurricanes and aerosols simulation

November 22 2017



Credit: NASA's Goddard Space Flight Center

Tracking the aerosols carried on the winds let scientists see the currents in our atmosphere. This visualization follows sea salt, dust, and smoke from July 31 to November 1, 2017, to reveal how these particles are transported across the map.

The first thing that is noticeable is how far the particles can travel. Smoke from fires in the Pacific Northwest gets caught in a weather

pattern and pulled all the way across the US and over to Europe. Hurricanes form off the coast of Africa and travel across the Atlantic to make landfall in the United States. Dust from the Sahara is blown into the Gulf of Mexico. To understand the impacts of aerosols, scientists need to study the process as a global system.

The Global Modeling and Assimilation Office (GMAO) at NASA's Goddard Space Flight Center has developed the Goddard Earth Observing System (GEOS), a family of mathematical models. Combined with data from NASA's Earth observing satellites, the supercomputer simulations enhance our scientific understanding of specific chemical, physical, and biological processes.

During the 2017 hurricane season, the storms are visible because of the sea salt that is captured by the storms. Strong winds at the surface lift the sea salt into the atmosphere and the particles are incorporated into the storm. Hurricane Irma is the first big storm that spawns off the coast of Africa. As the storm spins up, the Saharan dust is absorbed in cloud droplets and washed out of the storm as rain. This process happens with most of the storms, except for Hurricane Ophelia. Forming more northward than most storms, Ophelia traveled to the east picking up dust from the Sahara and smoke from large fires in Portugal. Retaining its tropical storm state farther northward than any system in the Atlantic, Ophelia carried the smoke and dust into Ireland and the UK.

Computer simulations using the GEOS models allow scientists to see how different processes fit together and evolve as a system. By using mathematical models to represent nature we can separate the system into component parts and better understand the underlying physics of each.

GEOS runs on the Discover supercomputer at the NASA Center for Climate Simulation (NCCS).

Tracking aerosols over land and water from August 1 to November 1, 2017. Hurricanes and tropical storms are obvious from the large amounts of sea salt particles caught up in their swirling winds. The dust blowing off the Sahara, however, gets caught by water droplets and is rained out of the storm system. Smoke from the massive fires in the Pacific Northwest region of North America are blown across the Atlantic to the UK and Europe. This visualization is a result of combining NASA satellite data with sophisticated mathematical models that describe the underlying physical processes.

Provided by NASA's Goddard Space Flight Center

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