

# NASA Africa Mission Investigates Origin, Development of Hurricanes

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NASA Africa Mission Investigates Origin, Development of Hurricanes

Scientists from NASA, the National Oceanic and Atmospheric Administration, universities and international agencies will study how winds and dust conditions from Africa influence the birth of hurricanes in the Atlantic Ocean.

The field campaign, called NASA African Monsoon Multidisciplinary Analyses 2006, runs from Aug. 15 to mid-September in the Cape Verde Islands, 563 kilometers (350 miles) off the coast of Senegal in West Africa. This campaign is a component of a much broader international project, called the African Monsoon Multidisciplinary Analyses, aimed at improving the knowledge and understanding of the West African Monsoon.

Researchers will use satellite data, weather station information, computer models and aircraft to provide scientists with better insight into all the conditions that enhance the development of tropical cyclones, the general name given to tropical depressions, storms and hurricanes. This research will help hurricane forecasters better understand the behavior of these deadly storms.

"Scientists recognize the hurricane development process when

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they see it, but our skill in forecasting which weak system will intensify into a major cyclone is not great," said Dr. Edward Zipser, mission chief scientist, of the University of Utah, Salt Lake City. "That is why NASA and its partners place a high priority on obtaining high-quality data for weak disturbances, as well as those already showing signs of intensification."

For hurricanes to develop, specific environmental conditions must be present: warm ocean water, high humidity and favorable atmospheric and upward spiraling wind patterns off the ocean surface. Atlantic hurricanes usually start as weak tropical disturbances off the West African coast and intensify into rotating storms with weak winds, called tropical depressions. If the depressions reach wind speeds of at least 63 kilometers (39 miles) per hour, they are classified as tropical storms. Hurricanes have winds greater than 117 kilometers (73 miles) per hour.

To study these environmental conditions, researchers will use NASA's DC-8 research aircraft as a platform for advanced atmospheric research instruments. Remote and on-site sensing devices, including two from NASA's Jet Propulsion Laboratory, Pasadena, Calif., will allow scientists to target specific areas in developing storms. Sensors on board the aircraft will measure cloud and particle sizes and shapes, wind speed and direction, rainfall rates, atmospheric temperature, pressure, and relative humidity. JPL's Airborne Dual-frequency Precipitation Radar is a next-generation rain radar that will be used to better characterize precipitation processes. JPL's High-Altitude Monolithic Microwave Integrated Circuit Sounding Radiometer measures temperature and moisture content in the atmosphere.

The campaign will use extensive data from NASA's fleet of Earth observing satellites, including the Tropical Rainfall Measurement Mission, QuikScat, Aqua, and the recently-launched CloudSat and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations, or Calipso. These advanced satellites will provide unprecedented views into the vertical structure of the tropical systems, while the field observations will help validate data from the new satellites. JPL manages QuikScat, CloudSat and the Atmospheric Infrared Sounder (Airs) instrument on Aqua.

During the field campaign, scientists hope to get a better understanding of the role of the Saharan Air Layer and how its dry air, strong embedded winds and dust influence cyclone development. The layer is a mass of very dry, often dusty air that forms over the Sahara Desert during the late spring, summer, and early fall and usually moves out over the tropical Atlantic Ocean.

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As part of looking at the Saharan Air Layer, scientists want to better understand dust's effect on clouds. Some evidence indicates that dust makes it more difficult for rain to form. Cloud models need to account for any such effect, so measurements of cloud–droplet concentrations and size in clean ocean air and dusty air from the Sahara need to be made.

Researchers also will look at what happens to air currents as they move from land to ocean waters. Information on clouds and moisture, heat, air movement, and precipitation in an unstable atmosphere will be collected, analyzed and then simulated in computer models. Understanding hurricane formation requires measurements from very small to large scales, from microscopic dust and raindrops to cloud formations and air currents spanning hundreds of kilometers.

More on NASA's hurricane research is at:

<http://www.nasa.gov/hurricane> .

More on Airborne Dual–frequency Precipitation Radar:

<http://trmm.jpl.nasa.gov/apr.html> ;

CloudSat: <http://www.nasa.gov/cloudsat> ;

QuikScat: <http://winds.jpl.nasa.gov/missions/quikscat/index.cfm> ;

Airs: <http://www-airs.jpl.nasa.gov/> .

The California Institute of Technology manages JPL for NASA.

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