FIELD PROJECT OVERVIEW

#1 HIPPO :: HIAPER Pole-to-Pole Observations

The "HIAPER Pole-to-Pole Observations (HIPPO) of Carbon Cycle and Greenhouse Gases Study" will measure gases in cross-sections of the atmosphere, going from near the North Pole to near the South Pole. In addition to measuring the atmosphere up and down the globe, the aircraft will also take measurements from the surface of the Earth up to the top of the troposphere, which is the lowest layer of the Earth's atmosphere. These measurements will be taken five times during different seasons over a three-year period. During these research flights, scientists will measure a complete set of atmospheric gases related to understanding the carbon cycle, including carbon dioxide, methane, and water vapor. This project will provide the first comprehensive, global study of atmospheric gases, covering the troposphere in every season and over multiple years, which will increase scientists' understanding of the how greenhouse gases are transported and circulated around the globe, and how the affect the climate system.

What is measured:
Atmospheric pressure, temperature, wind speed, aerosols, water vapor and chemical composition are studied to create a "snapshot" of Earth's atmosphere.

#2 DYNAMO :: Dynamics of the Madden-Julian Oscillation

The Madden-Julian Oscillation (MJO) is a 30 to 90 day tropical weather cycle that starts over the Indian Ocean at the equator and moves to the east, into the western Pacific Ocean. This weather cycle switches between large, strong rainstorms and periods with very few rainstorms. The region over the Indian Ocean where the MJO starts usually has cooler sea surface temperatures, which means not as many clouds are produced in this area. As the system continues, it moves eastward into the warmer waters of the western Pacific Ocean. These warmer waters allow cloud systems to build up. These storm systems move through the equatorial regions and have an impact on the weather and climate around the globe in both the Northern and Southern Hemispheres.

DYNAMO is studying the atmospheric and oceanic conditions in the Indian Ocean that make this large-scale weather pattern start.

What is measured:
Clouds, aerosols, sea surface temperature, atmospheric pressure, temperature, wind speed, ocean salinity & temperature over a large region covering the Indian Ocean.

FIELD PROJECT OVERVIEW

#3 PREDICT :: Pre-depression Investigation of Cloud-systems in the Tropics

Understanding and being able to predict the development of hurricanes in the tropics is one of the most challenging aspects of atmospheric science. Every year, many small storms develop off the coast of West Africa near the Cape Verde islands, but only a few of these develop into tropical depressions, storms, or hurricanes. This project will allow scientists to study storms that form in this part of the world with the hopes of learning more about why some of them become hurricanes.

What is measured:

Clouds, aerosols, sea surface temperature, atmospheric pressure, temperature, wind speed, wind direction, sea surface temperature, and chemicals in the atmosphere surrounding a developing storm over the ocean

#4 DC3 :: Deep Convective Clouds & Chemistry

The Deep Convective Clouds and Chemistry (DC3) field campaign is investigating the impact of large-scale thunderstorms on the upper part of the troposphere, which is the lowest of the Earth's five layers of the atmosphere. During the DC3 field project, scientists gathered observations from ground-based research equipment and from research aircraft that carry many different instruments.

As large thunderstorms develop, they "suck up" ground-level pollution into the upper atmosphere, acting like nature's vacuum cleaner. This process, as well as the intense heat from lightning, changes the chemical composition of the atmosphere deep within the thunderstorm. The chemicals are then "spit out" of the tail of the storm, depositing new chemicals high in the atmosphere. Many of these newly deposited chemical species are heat-trapping gases, such as ozone. These gases have an impact on temperature of the upper troposphere as well as how many clouds are produced.

What is measured:

Clouds, aerosols, atmospheric pressure, temperature, wind speed, lightning strikes, greenhouse gases and other chemicals in a particular thunderstorm.