



nrlpao@nrl.navy.mil
202-767-2541

NRL Press Release
91-08r
12/15/2008

NRL's P-3 Aircraft Support Project to Study Tropical Cyclones



Email

Follow NRL

RSS Feed

Related Visuals

The Naval Research Laboratory has been hunting for tropical cyclones as part of a multi-national study to understand, observe, and predict the potential impacts of Pacific tropical cyclones. This project, called Tropical Cyclone Structure-2008, is part of a nine-nation project being carried out with the endorsement of the World Meteorological Organization, a part of the United Nations. The main goal of Tropical Cyclone Structure-2008 is to increase the predictability of tropical cyclones in the western North Pacific region.

To carry out the study, one of NRL's NP-3 aircraft and two Air Force Reserve WC-130J aircraft deployed to Andersen Air Force Base, Guam, to conduct meteorological research on tropical cyclones in the Western Pacific from August through September. During the project, P-3 aircrews from Scientific Development Squadron ONE (VXS-1), the "Warlocks", Patuxent River, MD, and WC-130 aircrews from the 53rd Weather Reconnaissance Squadron "Hurricane Hunters," Keesler Air Force Base, MS, worked with scientists from several universities and research organizations sponsored by the Office of Naval Research (ONR) and the National Science Foundation. Dr. Patrick Harr, a professor at the Naval Postgraduate School, Monterey, CA, is the lead scientist for the program.

More than ten countries including scientists in the region from Japan, China, South Korea and Taiwan supported Tropical Cyclone Structure-2008, along with global partners such as Canada and the European Union because typhoons in the Pacific actually affect the ability to predict the weather across the entire Northern Hemisphere.

The team of scientists used the NP-3 and WC-130 aircraft because of their unique capabilities. NRL's specialized, modified P-3 aircraft is capable of studying the outer part of the typhoon, focusing on the how and why of its changes in structure and intensity, while the Air Force WC-130 aircraft are capable of studying the inner core of the typhoon and penetrating the eyewall.

The NRL NP-3, flying from Andersen Air Force Base, Guam, collected data on the structure and evolution of tropical cyclone including four typhoons. The P-3 was equipped with dropsondes, the National Center for Atmospheric Research's ELDORA radar, and a unique Doppler wind lidar developed under an Army Research Laboratory program with significant contributions by NRL and NASA's Langley Research Center. The Air Force's WC-130s were fitted with a variety of equipment used for weather research. During flight, the aircraft instruments measured numerous parameters including wind speed, wind direction, humidity, and temperature.

One of the critical pieces of equipment on board the WC-130 aircraft is the dropsonde system. The GPS dropsonde system is equipped with a high frequency radio to pass measured conditions back to the aircraft and is released from flight level on a parachute about every 100 miles over water. With its dropsonde deployments, on-board sensors, and the Stepped Frequency Microwave Radiometer, the WC-130 provided observations of the typhoon intensity and inner wind structure from the formation stage to the extra-tropical transition stage. As the dropsonde descends to the sea surface, it measures and relays to the aircraft a vertical atmospheric profile of the temperature, humidity and barometric pressure and wind data.

The researchers' goal is to learn more about how tropical cyclones form, intensify, and change through their life cycle and the impact they may later have across the North Pacific and Asia, North America and potentially Europe. The data collected during Tropical Cyclone Structure-2008 will validate the satellite-based techniques for intensity estimation in the Pacific. Prior to this time, this data had only been validated in the Atlantic where the WC-130s regularly fly such missions.

In addition to NRL's NP-3 and the Air Force's WC-130 aircraft, the DOTSTAR, a Taiwanese Astra business class jet, flew out of Taiwan and a Dassault Falcon 20E, another research-modified business class jet from DLR in Germany, flew from the U.S. Naval Air Facility Atsugi, Japan. Both aircraft deploy dropsondes and carry other equipment for meteorological studies.

Along with the aircraft, scientists working from Hawaii launched high-altitude driftsondes. Driftsondes are zero-pressure balloons that go up to 80,000 feet. These balloons have a gondola that has small dropsondes the scientists release remotely by satellite. Tropical Cyclone Structure-2008 is the first research program to observe tropical cyclones from their formation near Guam to their transition into the midlatitudes near Japan. The scientists are hopeful that the data gathered during Tropical Cyclone Structure-2008 will help in understanding and predicting similar events in the Pacific and the Atlantic.



Figure 1: Military and scientific aircrew from VXS-1, National Center for Atmospheric Research, and Naval Postgraduate School pose for a picture at Yokota AB, Japan.



Figure 2: LT Brendan Cremins, NRL Code 1400, looking at ELDORA radar data to safely navigate aircraft in the typhoon environment.



Figure 3: LCDR Caleb Brown piloting aircraft.



Figure 4: View of Mt. Fuji en route to Typhoon Sinlaku.



Figure 5: On deck at Kadena AB, Okinawa.

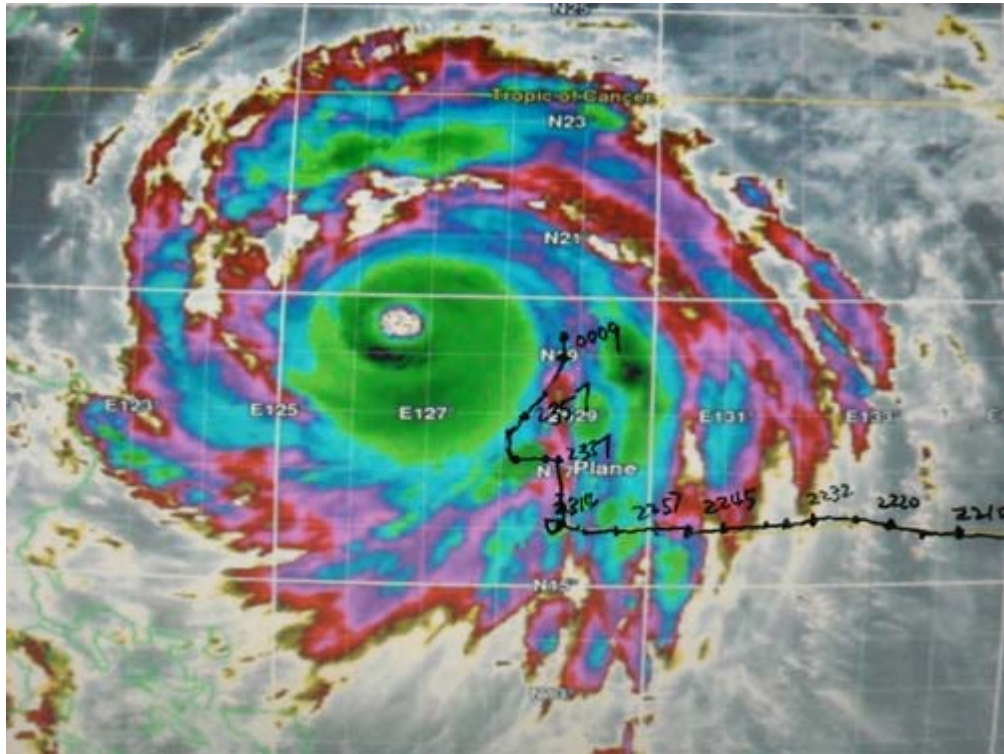


Figure 6: Image of Super-Typhoon Jangmi. A super-typhoon is comparable to a category 4 or 5 hurricane in the Atlantic.

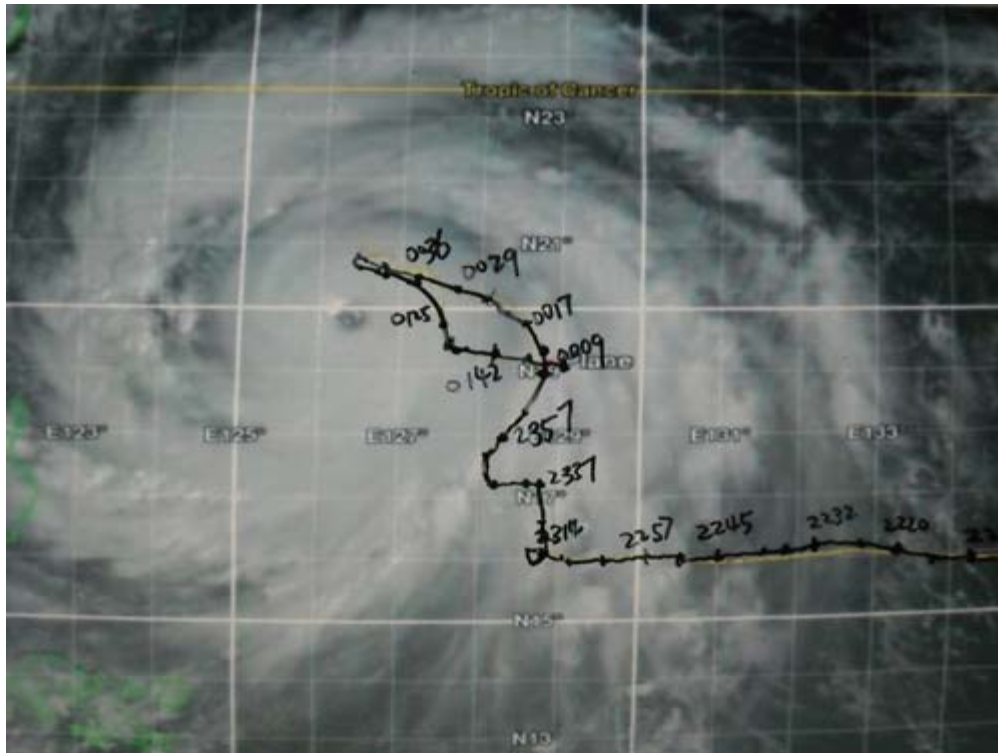


Figure 7: Image of Super-Typhoon Jangmi.