2022 NOAA/AOML/HRD Hurricane Field Program - APHEX

END STAGE EXPERIMENT
Flight Pattern Description

Experiment/Module: Extratropical Transition

Investigator(s): Sim D. Aberson

Requirements: TC making landfall, undergoing rapid weakening, or extratropical transition

End Stage Science Objective(s) Addressed:

1) Collect observations targeted at better understanding changes TCs undergo while rapidly weakening over the open ocean or undergo extratropical transition [*APHEX Goals 1, 3*].

2) Test new (or improved) technologies with the potential to fill gaps, both spatially and temporally, in the existing suite of airborne measurements in landfalling TCs, rapidly weakening TCs, and TCs undergoing extratropical transition. These measurements include improved three-dimensional representation of the TC wind field, more spatially dense thermodynamic sampling of the boundary layer, and more accurate measurements of ocean surface winds [*APHEX Goal 2*].

P-3 Pattern #1:

What to Target: Two specific targets are to be sampled during each mission, the TC itself, and the interface between the TC and the environmental flow.

When to Target: The systems will be sampled every 12 h from the time it begins the transition to an extratropical cyclone to the time it is out of range of the aircraft, or the system dissipates

Pattern: The patterns would likely be non-standard patterns. At least two passes through the center of the TC will be completed during the mission, though they need not be consecutive. The P-3 will fly as high as possible to avoid hazards such as convective icing. Legs should be of equal length, except that they can be shortened to the south of the storm center if necessary to save time, or shortened due to land. If extra time is available, important interactions between the midlatitude jet stream and the outflow from the TC occur. This region will be investigated by releasing dropwindsondes every ~120 n mi during this part of the pattern.

Flight altitude: As high as safely possible.

Leg length or radii: Leg lengths depend on the size of the transitioning system. They should be of equal length, but can be shortened to the south, or due to land.

Estimated in-pattern flight duration: 8h

Expendable distribution: 10 dropwindsondes, 10 AXBTs. During passes through the center, dropwindsondes will be deployed at each turn point and at evenly spaced intervals along each leg with optimal spacing near 90 n mi. AXBTs will be deployed at each turn point and at the midpoint of each leg only in the northern semicircle from the cyclone center.

Instrumentation Notes: Due to a trapped-fetch phenomenon, the ocean surface wave heights can reach extreme levels ahead of a TC undergoing ET. Therefore, primary importance for the P-3 in the northeast quadrant of the TC will be the scanning radar altimeter (WSRA) to observe the ocean surface wave spectra, if available. Flight level will be chosen to accommodate this instrument.

G-IV Pattern #1

What to Target: Two specific targets are to be sampled during each mission, the TC itself, and the interface between the TC and the environmental flow.

When to Target: The systems will be sampled every 12 h from the time it begins the transition to an extratropical cyclone to the time it is out of range of the aircraft, or the system dissipates.

Pattern: The patterns would likely be non-standard patterns. At least two passes through the center of the TC will be completed during the mission, though they need not be consecutive. Legs should be of equal length, except that they can be shortened to the south of the storm center if necessary to save time, or shortened due to land. Ahead of the TC, important interactions between the midlatitude jet stream and the outflow from the TC occur.

Flight altitude: As high as possible.

Leg length or radii: Leg lengths depend on the size of the transitioning system. They should be of equal length, but can be shortened to the south, or due to land.

Estimated in-pattern flight duration: 8 h

Expendable distribution: ~20 dropwindsondes. During passes through the center, dropwindsondes will be deployed at each turn point and at evenly spaced intervals along each leg with optimal spacing near 90 n mi. At the TC-environment interface, dropwindsondes should be released every ~120 n mi.

Instrumentation Notes: None