2021 NOAA/AOML/HRD Hurricane Field Program - APHEX

MATURE STAGE EXPERIMENT
Flight Pattern Description

Experiment/Module: Gravity Wave

Investigator(s): Jun Zhang (PI) and David Nolan (co-PI)

Requirements: Categories 2–5

Mature Stage Science Objective(s) Addressed:

1) Collect observations targeted at better understanding internal processes contributing to mature hurricane structure and intensity change [*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 mature hurricanes. These measurements include improved three-dimensional representation of the hurricane 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 (Internal Processes):

What to Target: Sample the inner core and near environments of the TC

When to Target: Any strength TC; no land restrictions. This module ideally should be conducted in quadrant with the least rainband activity, typically the upshear right or right-real quadrant. The best opportunity is at the end of a standard Figure-4 pattern, when the last leg terminates in a quadrant with less rainbands.

Pattern: Any standard P-3 pattern that provides symmetric coverage (e.g., Rotated Figure-4, Figure-4 Butterfly, etc.). At the end of the last leg, continue outward to distance of 160 n mi (295 km) from the center, or further if possible (see Fig. MA-1). Then turn the P-3 around and head directly back to the eye, retracing the previous leg in the opposite direction.

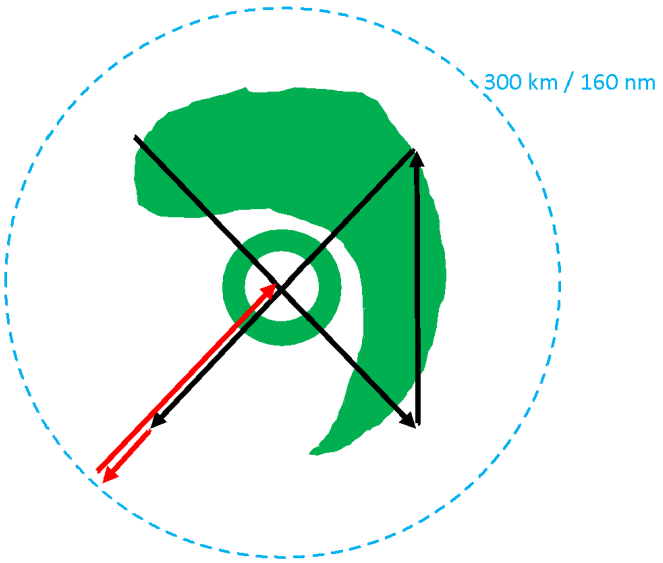

Figure MA-1. *Depiction of the Gravity Wave module in which the P-3 flies an extended leg [160 n mi*

MATURE STAGE EXPERIMENT
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Flight altitude: 5-10 kft as high as possible. The module should be conducted below the freezing level.

Leg length or radii: Leg lengths should extend to at least 160 n mi (295 km) from the center, or further if time permits, including the turn leg back the center.

Estimated in-pattern flight duration: ~40 min – 1 hr

Expendable distribution: Dropsonde and AXBTs are not a requirement

Instrumentation Notes: Use TDR defaults. Use straight flight legs as safety permits. After finishing the outbound leg, please turn as fast as possible as safety permits.

P-3 Pattern 2 (Internal Processes):

What to Target: Sample the inner core and near environments of the TC.

When to Target: Any strength TC; no land restrictions. This module ideally should be conducted in quadrant with the least rainband activity, typically the upshear right or right-real quadrant. The best opportunity is at the end of a standard Figure-4 pattern, when the last leg terminates in a quadrant with less rainbands.

Pattern: Any standard P-3 pattern that provides symmetric coverage (e.g., Rotated Figure-4, Figure-4 Butterfly, etc.). At the end of the last leg (outbound or downwind leg), continue outward to distance of 90 n mi (165 km) from the end point, or further if possible (see Fig. MA-2). Then turn the P-3 around and head directly back to the eye, retracing the previous leg in the opposite direction to the end point before starting next radial leg or downwind leg.

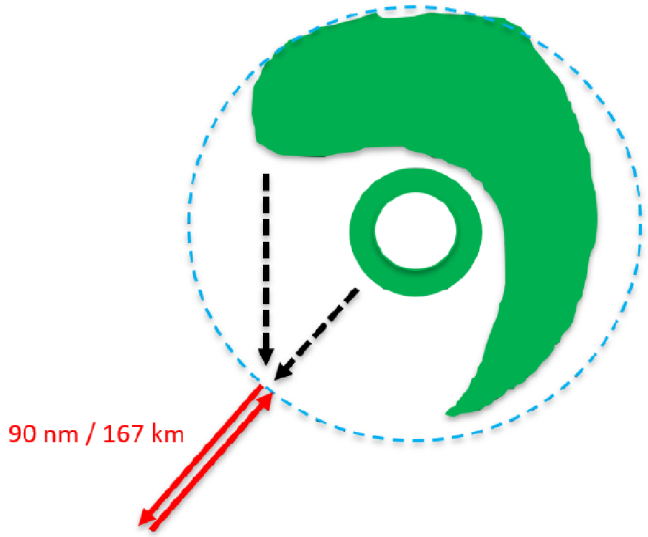

Figure MA-2. *Depiction of the Gravity Wave module in which the P-3 flies an extended leg (90 n mi) (red path) and reverses course along the same azimuth back toward the storm center.*

MATURE STAGE EXPERIMENT
Flight Pattern Description

Flight altitude: 5-10 kft as high as possible. The module should be conducted below the freezing level.

Leg length or radii: Leg lengths should extend to at least 90 n mi from the end point, or further if time permits, including the turn leg back the previous end point.

Estimated in-pattern flight duration: ~40 min – 1 hr

Expendable distribution: Dropsondes and AXBTs are not a requirement.

Instrumentation Notes: Use TDR defaults. Use straight flight legs as safety permits. After finishing the outbound leg, please turn as fast as possible as safety permits.