2022 NOAA/AOML/HRD Hurricane Field Program - APHEX

MATURE STAGE EXPERIMENT
Flight Pattern Description

Experiment/Module: Tropical Cyclone Diurnal Cycle Module

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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) Collect observations targeted at better understanding the response of mature hurricanes to their changing environment, including changes in vertical wind shear, moisture and underlying oceanic conditions [APHEX Goals 1, 3].

P-3 Pattern #1:

What to Target: Sample the near environment (R~80-160 n mi / R~150-300 km) of the TC boundary layer. This module can be conducted in any quadrant of the storm.

When to Target: TC distance to land should be ≥250 n mi (≥460 km). Optimally, this module should be conducted during the peak day (~12-18 LT) or night (~00-06 LT) phases of the TCDC. Additionally, this module should only be conducted if consecutive 12-hr P-3 missions are planned and the module can be conducted in the same quadrant of the storm for 2 consecutive missions. Separation between the 2 consecutive missions should be ~9-15 hr and should include 1 day and 1 night mission.

Pattern: Any standard P-3 pattern that provides symmetric coverage (e.g., Rotated Figure-4, Figure-4 Butterfly, etc.). This module can be conducted during the inbound ferry to the IP [Option A, Fig. 1] or during the final outbound leg in the pattern [Option B, Fig. 2]. A series of 5 dropsondes will be deployed in a straight radial leg to (or from) the storm.

- Option A (inbound, Fig. 1): a series of 5 dropsondes should be deployed every 20 n mi starting at R=160 n mi (~300 km) and ending at R=80 n mi (~150 km).
- Option B (outbound, Fig. 2): a series of 5 dropsondes should be deployed every 20 n mi starting at R=80 n mi (~150 km) and ending at R=160 n mi (~300 km).

There are no requirements for dropsondes inside or outside of R=80-160 n mi (~150-300 km). However, routine dropsondes inside of R=80 n mi (~150 km) would be beneficial to the module science objectives.

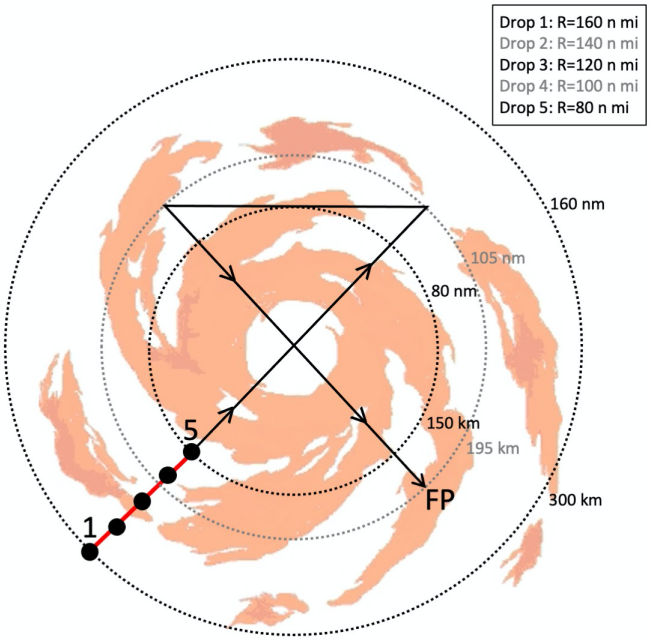

Figure 1. *TCDC Module (Option A) with 5 dropsondes (black circles) launched between R=160-80 n mi (~300-150 km) spaced 20 n mi apart.*

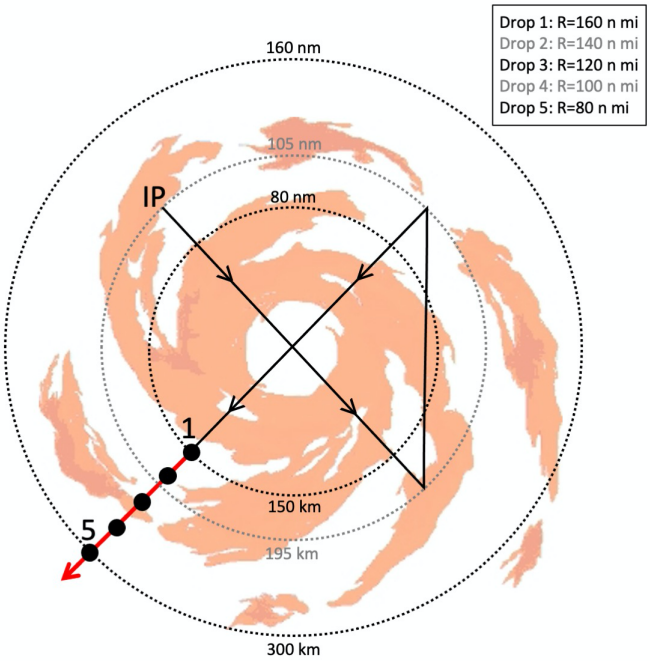

Figure 2. *TCDC Module (Option B) with 5 dropsondes (black circles) launched between R=80-160-80 n mi (~150-300 km) spaced 20 n mi apart.*

Flight altitude: 8-12 kft pressure altitude (radar altitude is acceptable) or as high as possible to provide better vertical sampling by GPS dropsondes that are deployed.

Leg length or radii: Leg lengths should be ~ 80 n mi, spanning from R=80 to R=160 n mi (~150-300 km) from the storm center.

Estimated in-pattern flight duration: ~25 min

Expendable distribution: 5 dropsondes spaced 20 n mi apart

Instrumentation Notes: Use TDR defaults. GPS dropsondes should be quality controlled and transmitted to the GTS in real-time. Use straight flight legs as safety permits.

P-3 Pattern #2:

What to Target: Sample the near environment (R~80-160 n mi / R~150-300 km) of the TC boundary layer. This module can be an add-on to the Gravity Wave Module and can be conducted in any quadrant of the storm.

When to Target: TC distance to land should be ≥250 n mi (≥460 km). Optimally, this module should be conducted during the peak day (~12-18 LT) or night (~00-06 LT) phases of the TCDC. Additionally, this module should only be conducted if consecutive 12-hr P-3 missions are planned and the module can be conducted in the same quadrant of the storm for 2 consecutive missions. Separation between the 2 consecutive missions should be ~9-15 hr and should include 1 day and 1 night mission.

Pattern: Any standard P-3 pattern that provides symmetric coverage (e.g., Rotated Figure-4, Figure-4 Butterfly, etc.). This module but is only practical if the Gravity Wave Module is preceded or followed by an inbound or outbound leg to or from the center of the storm. This allows for dropsonde sampling that spans the required R=80-160 n mi (~150-300 km) radial leg.

A series of dropsondes will be deployed in a straight radial leg to (or from) the storm.

- Option A (inbound, Fig. 1): a series of 5 dropsondes should be deployed every 20 n mi starting at R=160 n mi (~300 km) and ending at R=80 n mi (~150 km).
- Option B (outbound, Fig. 2): a series of 5 dropsondes should be deployed every 20 n mi starting at R=80 n mi (~150 km) and ending at R=160 n mi (~300 km).

There are no requirements for dropsondes inside or outside of R=80-160 n mi (~150-300 km). However, routine dropsondes inside of R=80 n mi (~150 km) would be beneficial to the module science objectives.

Flight altitude: 8-12 kft pressure altitude (radar altitude is acceptable) or as high as possible to provide better vertical sampling by GPS dropsondes that are deployed.

Leg length or radii: Leg lengths should be ~ 80 n mi, spanning from R=80 to R=160 n mi (~150-300 km) from the storm center.

Estimated in-pattern flight duration: ~25 min

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Expendable distribution: 5 dropsondes spaced 20 n mi apart

Instrumentation Notes: Use TDR defaults. GPS dropsondes should be quality controlled and transmitted to the GTS in real-time. Use straight flight legs as safety permits.