OCEAN OBSERVING EXPERIMENT
Flight Pattern Description

Experiment/Module: Tropical Cyclone Boundary layer (TCBL)

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Requirements: TS, Categories 1–5 (*Note that this module can be conducted in any strength storm if needed*)

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: Rotated Figure-4

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

When to Target: Any strength TC; no land restrictions. This module complements standard Tail Doppler Radar (TDR) missions.

Pattern: The rotated Figure-4 pattern instead of a single Figure-4 is preferable to better resolve higher (than 1) wavenumber asymmetric structure. It is preferable to fly the pattern as orthogonal pairs of radials as the flight proceeds. The initial (IP) and final (FP) points of the pattern are arbitrary. We will not consider a single Figure-4 pattern for the TCBL module.

Flight altitude: 10–12 kft or as high as possible. Either radar or pressure altitude is good.

Leg length or radii: Leg lengths can follow the TDR mission. The standard radial leg length for TDR missions is 105 n mi (195 km), but this can be adjusted as needed for land restrictions and ferry times.

Estimated in-pattern flight duration: See the listing of standard pattern figures in the section entitled "Standard Patterns and Expendable Locations" section. The flight duration is ~ 5 h for a P3 mission.

Expendable distribution: This pattern requires 34 dropsondes and 16 AXBTs. Dropsondes are deployed at 105 n mi and 60 n mi radii, the radius of maximum wind (RMW) along each of 8 radial legs (rotated Figure-4 pattern), and storm center. On 4 of the 8 passes across the RMW, rapid deployment (~1 min spacing) of 3 dropsondes is requested. Center drops are requested on the initial and final pass through the eye. AXBT (16 total) deployments are paired with dropsondes at the indicated locations. The number of AXBTs can be reduced to 4 if IRsondes are used in the storm

center and outside the RMW. Optionally, small uncreweed aircraft systems (sUAS) can be utilized in conjunction with these instruments to augment the boundary layer measurements from AXBTs and dropsondes (see RSUAVE experiment).

Instrumentation Notes: Use TDR defaults. Use straight flight legs as safety permits.

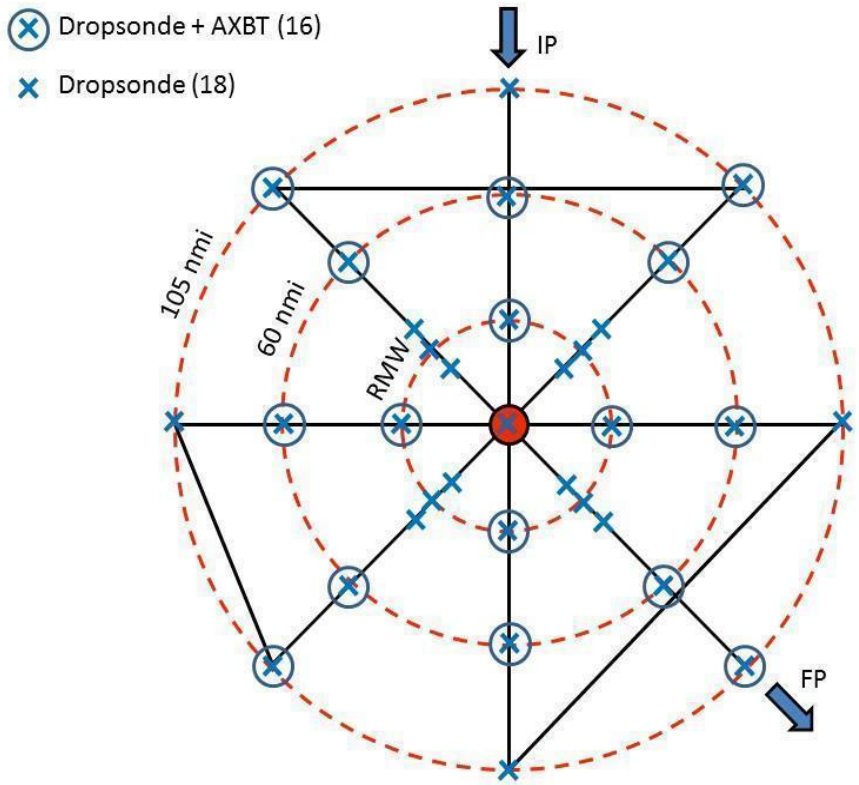

Figure MA-1. Rotated Figure-4 pattern for the HBL module.

P-3 Pattern #2: Butterfly

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

When to Target: Any strength TC; no land restrictions. This module complements standard Tail Doppler Radar (TDR) missions.

Pattern: Butterfly pattern. The initial (IP) and final (FP) points of the pattern are arbitrary.

Flight altitude: 10–12 kft or as high as possible. Either radar or pressure altitude is good.

Leg length or radii: Leg lengths can follow the TDR mission. The standard radial leg length for TDR missions is 105 n mi (195 km), but this can be adjusted as needed for land restrictions and ferry times.

Estimated in-pattern flight duration: See the listing of standard pattern figures in the section entitled "Standard Patterns and Expendable Locations" section. The total duration is ~ 3 h 25 min for a P3 mission with Butterfly pattern.

Expendable distribution: This module requires 21 dropsondes and 12 AXBTs. Dropsondes are deployed at the storm center, 105 n mi radii (i.e., end point), the radius of maximum wind (RMW), and the mid-point between the RMW along each of 6 radial legs (Butterfly pattern). Center drops are requested on the initial and final pass through the eye. AXBT (12 total) deployments are paired with dropsondes at the RMW and mid-point along each of 6 radial legs. The number of AXBTs can be reduced to 4 if IRsondes are used in the eye and outside the RMW. Optionally, small uncreweed aircraft systems (sUAS) can be utilized in conjunction with these instruments to augment the boundary layer measurements from AXBTs and dropsondes (see RSUAVE experiment).

Instrumentation Notes: Use TDR defaults. Use straight flight legs as safety permits.

P-3 Pattern #3: Circumnavigation

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

When to Target: Any strength TC; no land restrictions. This module complements standard Tail Doppler Radar (TDR) missions.

Pattern: P3 Circumnavigation pattern. The initial (IP) and final (FP) points of the pattern are arbitrary.

Flight altitude: 10–12 kft or as high as possible. Either radar or pressure altitude is good.

Leg length or radii: The radius of the circumnavigation can follow the leg length/radius of the main pattern such as during a TDR mission that has a standard radial leg length of 105 n mi (195 km). Note that the radius of the circumnavigation can be adjusted as needed for land restrictions and ferry time.
Estimated in-pattern flight duration: See the listing of standard pattern figures in the section entitled "Standard Patterns and Expendable Locations" section. The total duration is ~ 4 h 5 min for a P3 mission.

Expendable distribution: This module requires 21 dropsondes and 8 AXBTs. Dropsondes are deployed at the storm center of first pass, the end points of Figure-4 (105 n mi), vertices of the octagon and the radius of maximum wind (RMW). Center drops are requested on the initial and final pass through the eye. AXBT (12 total) deployments are paired with dropsondes at vertices of octagon flight path and at the RMW. The number of AXBTs can be reduced to 4 if IRsondes are used in the eye and outside the RMW. Optionally, small uncreweed aircraft systems (sUAS) can be utilized in conjunction with these instruments to augment the boundary layer measurements from AXBTs and dropsondes (see RSUAVE experiment).

Instrumentation Notes: Use TDR defaults. Use straight flight legs as safety permits.