2018 NOAA/AOML/HRD Hurricane Field Program - IFEX

SYNOPTIC FLOW EXPERIMENT
Pattern and Module Descriptions

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Requirements: No requirements: flown at any stage of the TC lifecycle

SCIENCE OBJECTIVE #1: *Investigate new strategies for optimizing the use of aircraft observations to improve numerical forecasts of TC track, intensity, and structure*
(Synoptic Flow)

P-3 Pattern #1: Synoptic Flow

What to Target: Sample the core and surrounding environment of the TC or pre-genesis invest

When to Target: Sample when model-targeting guidance indicates viable targets (e.g., see Fig. SY-1) that could positively impact the TC or pre-genesis invest track, intensity, or structure. Any intensity TC (or invest); no land restrictions; no specific take-off time requirements. If possible, this P-3 module should be conducted in coordination with **G-IV Pattern #1: Synoptic Flow**.

Pattern: For invests, any standard pattern that provides symmetric coverage (e.g., Lawnmower, Square Spiral, Figure-4, Rotated Figure-4, Butterfly). For TCs, fly any standard pattern that provides symmetric coverage (e.g., Figure-4, Rotated Figure-4, Butterfly, P-3 Circumnavigation).

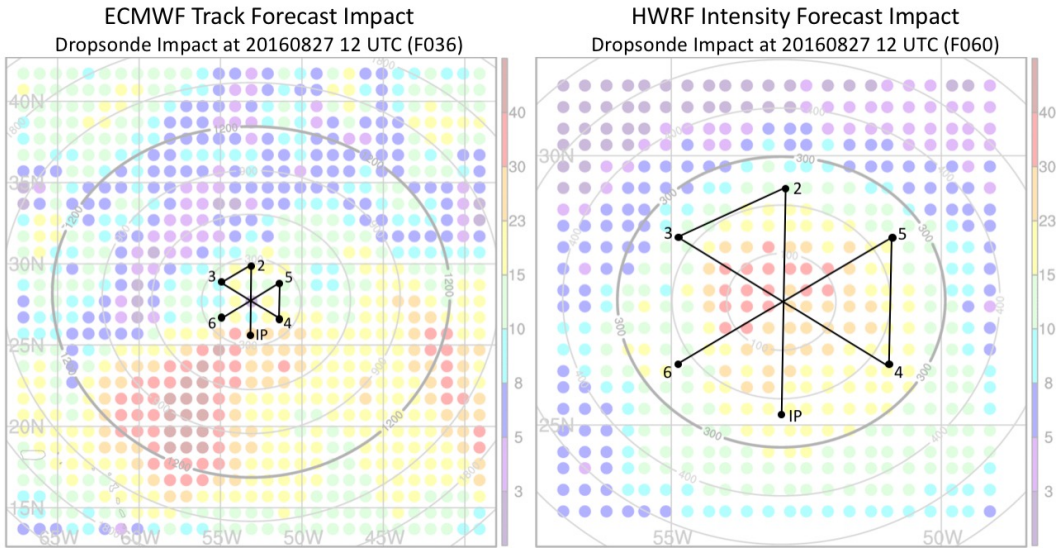

Figure SY-1. *P-3 Synoptic Flow pattern for a mission flown in 2016 Hurricane Gaston on 27 Aug 1200 UTC designed to impact the forecast for 29 Aug 0000 UTC. The plots show hypothetical reductions in (left) ECMWF position variance and (right) HWRF intensity variance due to assimilating GPS dropsonde data at each horizontal location. Warmer colors denote areas where GPS dropsonde data could most effectively reduce variance amongst the ensemble members.*

Flight altitude: 10–12 kft in the inner core and as high as possible in the near environment (>~80 n mi/150 km) to provide better vertical sampling by dropwindsondes that are deployed. If the P-3 is coordinated with the G-IV, P-3 altitudes greater than 10–12 kft may not be necessary.

Leg length or radii: Standard leg lengths (105 n mi) in TCs, but legs should be extended to reach the radius of 34 kt winds whenever possible (~125 n mi for North Atlantic hurricanes)

Estimated in-pattern flight duration: ~2.25–6.0 hr

Expendable distribution: Standard (10–20 dropwindsondes), although fewer may be used. Additional dropwindsondes are desirable in regions with high thermodynamic gradients or regions of downdrafts. AXBTs are not a mission requirement.

Instrumentation Notes: Use TDR defaults. Use straight flight legs as safety permits. All dropwindsonde data should be transmitted to the Global Telecommunication System (GTS) in real-time to ensure availability for assimilation into forecast models.

G-IV Pattern #1: Synoptic Flow

What to Target: Sample the near and peripheral environments of the TC or pre-genesis invest. If the P-3 is not available, the G-IV could also overfly or circumnavigate as closely as possible, the TC core or pre-genesis invest.

When to Target: Sample when model-targeting guidance indicates viable targets (e.g., see Fig. SY-2) that could positively impact the invest/TC track, intensity, or structure. Any strength TC (or pre-genesis invest); no land restrictions. If possible, this G-IV module should be conducted in coordination with **P-3 Pattern #1: Synoptic Flow**.

Pattern: Variable from storm to storm, dictated by regions that are identified using model targeting techniques. The over storm or near storm portion of the pattern could incorporate the following patterns: Figure-4, Rotated Figure-4, Butterfly, Lawnmower, G-IV Circumnavigation, G-IV Star pattern, or G-IV Star with Circumnavigation.

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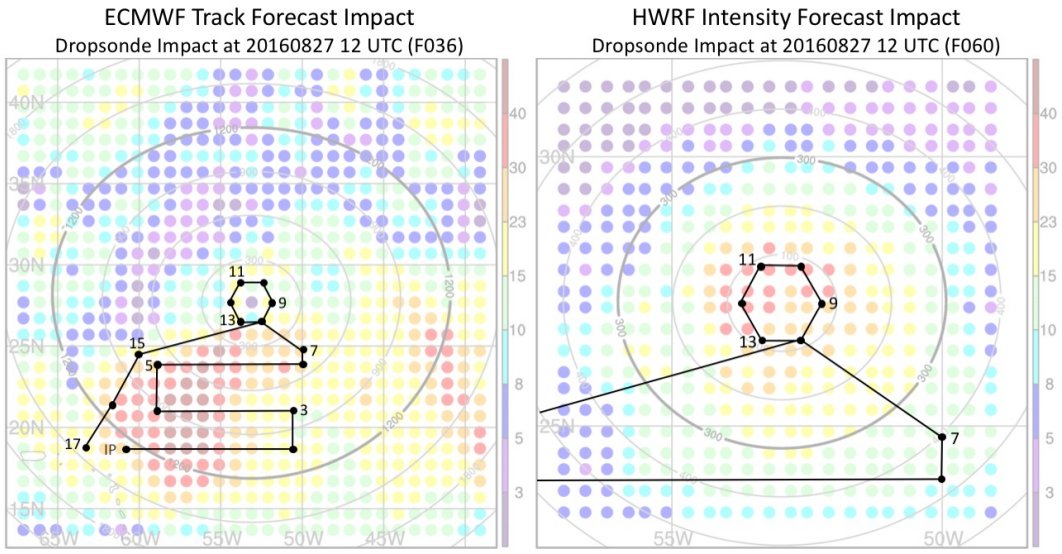

Figure SY-2. *G-IV Synoptic Flow pattern for a mission flown in 2016 Hurricane Gaston on 27 Aug 1200 UTC designed to impact the forecast for 29 Aug 0000 UTC. The plots show hypothetical reductions in (left) ECMWF position variance and (right) HWRF intensity variance due to assimilating GPS dropsonde data at each horizontal location. Warmer colors denote areas where GPS dropsonde data could most effectively reduce variance amongst the ensemble members.*

Flight altitude: 40–45 kft or as high as possible to provide better vertical sampling by dropwindsondes that are deployed

Leg length or radii: Standard leg lengths for over-storm patterns. For near-storm patterns, inner points and circumnavigation radii should be as close to the edge of the inner core convection as possible. This distance will be dictated by safety considerations, will typically range from ~60–120 n mi, and will require coordination between the HRD LPS and Flight Director on the G-IV.

Estimated in-pattern flight duration: ~2.5–7.5 hr

Expendable distribution: Standard in the pre-invest/TC inner core. For the near and far environments, ~2–3 degree spacing in quiescent regions and oversampling (~1–2 degree spacing) in model-indicated target areas.

Instrumentation Notes: Use TDR defaults. Use straight flight legs as safety permits. All dropwindsonde data should be transmitted to the Global Telecommunication System (GTS) in real-time to ensure availability for assimilation into forecast models.