2019 NOAA/AOML/HRD Hurricane Field Program - IFEX

SATELLITE VALIDATION EXPERIMENT
Flight Pattern Descriptions

Experiment/Module: NESDIS JPSS Satellite Validation Experiment

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

Science Objective(s):

1) Validate NOAA Unique Combined Atmospheric Processing System (NUCAPS) atmospheric profiles of temperature and moisture derived from the NOAA-20 and Suomi-NPP satellites in a variety of environments using G-IV GPS dropsonde data.

G-IV Pattern 1/Module 1:

What to Target: Sample a variety of environments including the Saharan Air Layer (SAL) and tropical disturbances [e.g., African easterly waves (AEWs), invests, and TCs]. Although not a requirement, SAL targets would preferably be interacting with a tropical disturbance.

When to Target: G-IV flight patterns and take-off times will be adjusted to sample targets that maximize temporal and spatial overlap with overpasses by the NOAA-20 and Suomi-NPP satellites. GPS dropsonde sampling should be timed to be ≤1 hr and ≤27 n mi (50 km) of collocated NUCAPS sounding granules and will depend on the area of operation (determined on a case-by-case basis).

Pattern: For SAL-only sampling, a standard (or modified) Lawnmower pattern will be flown. For targets with a tropical disturbance interacting with the SAL, the following standard patterns can be flown: Figure-4, Rotated Figure-4, Butterfly, Lawnmower, Square Spiral, G-IV Circumnavigation, G-IV Star, or G-IV Star with Circumnavigation. For TC targets, circumnavigations will be flown as close to the inner core as safety permits (e.g., R≥60-90 n mi/110-165 km) and legs should extend out to the (near) cloud free region in the periphery of the storm (e.g., R~160-215+ n mi/300-400+ km).

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

Leg length or radii: Standard leg lengths for over-storm patterns. For near-storm patterns, inner points and optional inner 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 ~60–90 n mi (110-165 km), and will require coordination between the HRD LPS and G-IV Flight Director. Legs should extend out to the (near) cloud free region in the periphery of the storm (e.g., R~160-215 n mi/300-400 km) to sample regions where NUCAPS soundings will be less affected by cloud contamination.

Estimated in-pattern flight duration: ~1.0–7.5 hr

Expendable distribution: For the near and far environments (e.g., R=80-215+ n mi/150-400+ km), ~2–3 degree (120-180 n mi/220-335 km) dropsonde spacing in quiescent regions and ~0.25-1 degree (15-60 n mi/30-110 km) oversampling in target areas of interest (e.g., the SAL leading edge, SAL midlevel easterly jet, or SAL dry air intrusions into the TC periphery). Oversampling is especially desirable in areas where there are also coincident NOAA-20 and Suomi-NPP satellite overpasses. Standard dropsonde distributions near the outer edge of the "inner core" convection (R~80-105 n mi/150-200 km) associated with the AEW, invest, or TC.

Instrumentation Notes: Use TDR defaults (though not a requirement for this experiment). Use straight flight legs as safety permits. All GPS dropsonde data should be transmitted to the Global Telecommunication System (GTS) in real-time to ensure availability for assimilation into forecast models.

G-IV Pattern 2/Module 2:

What to Target: Sample the environment of a tropical disturbance [e.g., African easterly wave (AEW), invest, or TC].

When to Target: G-IV flight patterns and take-off times will be adjusted to sample targets that maximize temporal and spatial overlap with overpasses by the NOAA-20 and Suomi-NPP satellites. GPS dropsonde sampling should be timed to be ≤1 hr and ≤27 n mi (50 km) of collocated NUCAPS sounding granules and will depend on the area of operation (determined on a case-by-case basis).

Pattern: The following standard patterns can be flown: Figure-4, Rotated Figure-4, Butterfly, Lawnmower, Square Spiral, G-IV Circumnavigation, G-IV Star, or G-IV Star with Circumnavigation. For TC targets, circumnavigations will be flown as close to the inner core as safety permits (e.g., R≥60-90 n mi/110-165 km) and legs should extend to the (near) cloud free region in the periphery of the storm (e.g., R=160-215+ n mi/300-400+ km).

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

Leg length or radii: Standard leg lengths for over-storm patterns. For near-storm patterns, inner points and optional inner 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 ~60–90 n mi (110-165 km), and will require coordination between the HRD LPS and G-IV Flight Director. Legs should extend out to the (near) cloud free region in the periphery of the storm (e.g., R~160-215 n mi/300-400 km) to sample regions where NUCAPS soundings will be less affected cloud contamination.

Estimated in-pattern flight duration: ~1.0–7.5 hr

Expendable distribution: For the near and far environments (e.g., R=80-215 n mi/150-400 km), ~2–3 degree (120-180 n mi/220-335 km) GPS dropsonde spacing in quiescent regions and ~0.25-1 degree (15-60 n mi/30-110 km) oversampling in target areas of interest (e.g., moisture gradients in the near environment around the inner core). Oversampling is especially desirable in areas where there are also coincident NOAA-20 and Suomi-NPP satellite overpasses. Standard GPS dropsonde distributions near the "inner core" (R~80-105 n mi/150-200 km) of the AEW, invest, or TC.

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