SATELLITE VALIDATION EXPERIMENT
Flight Pattern Description

Experiment/Module: ADM-Aeolus Satellite Validation Module

Investigator(s): Lisa Bucci (Co-PI), Jason Dunion (Co-PI), Lidia Cucurull (Co-PI), Mike Hardesty (Co-PI, University of Colorado - NOAA/CIRES), Ralph Foster (University of Washington)

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

Early Stage Science Objective(s) Addressed:

1) Test new (or improved) satellite technologies with the potential to fill gaps, both spatially and temporally, in the existing suite of airborne measurements in TCs. These measurements include improved three-dimensional representation of the hurricane wind field and thermodynamic structure and more accurate measurements of ocean surface winds and underlying ocean conditions [APHEX Goal 2]

P-3 Pattern #1

What to Target: Coordinated underflights of the ADM-Aeolus satellite in the environments of tropical disturbances (e.g., African easterly waves, invests, and TCs) and the Saharan air Layer (SAL).

When to Target: P-3 flight patterns will be adjusted to coordinate temporal and spatial overlap with overpasses by the ADM-Aeolus satellite. GPS dropsonde and P-3 tail Doppler radar (TDR) sampling should be timed to be ≤30 min and ≤15 n mi (25 km) of collocated ADM-Aeolus wind and aerosol retrievals and will depend on the area of operation (determined on a case-by-case basis).

Pattern: This is a breakaway pattern that involves a straight-line leg that underflies the ADM-Aeolus satellite and requires an offset of 125 n mi (230 km) from nadir (due to the 35^{o} scan angle of the satellite's Aladin lidar instrument). The P-3 leg should ideally begin ~10-15 min before and continue for ~10-15 min after the satellite passes "overhead". This will equate to a P-3 leg length of ~90-135 n mi (165-250 km). NASA's MTS aircraft software should be used to coordinate the underflight.

For ADM-Aeolus satellite ***ascending*** orbital passes (see Fig. 1):
- ADM-Aeolus crosses the equator (SSE-NNW) at 1800 LST
- P-3 underflight legs will be generally oriented SSE-NNW
- P-3 underflight legs will offset 125 n mi (230 km) to the east of nadir

For ADM-Aeolus satellite ***descending*** orbital passes (see Fig. 1):
- ADM-Aeolus crosses the equator (NNE to SSW) at 0600 LST
- P-3 underflight legs will be generally oriented NNE-SSW
- P-3 underflight legs will offset 125 n mi (230 km) to the west of nadir

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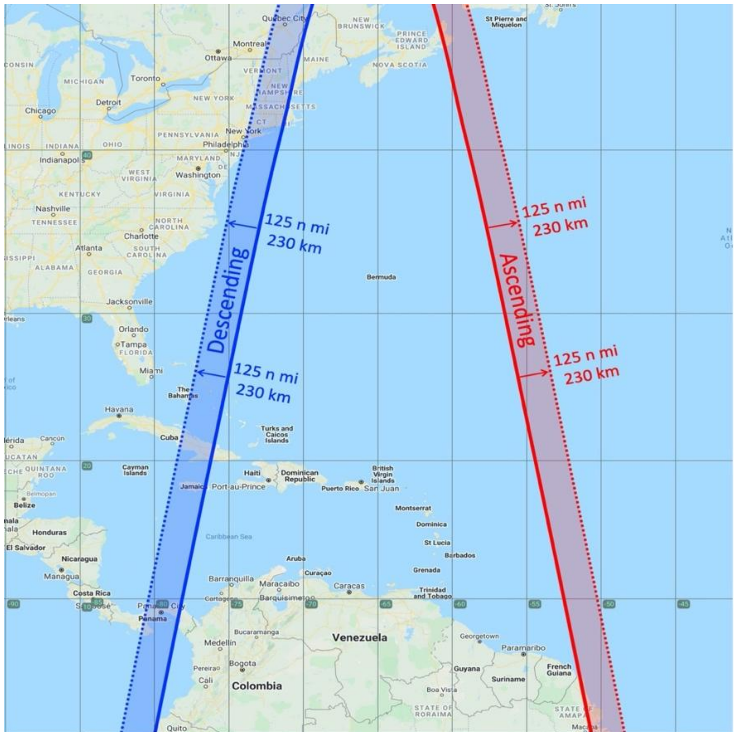

Fig. 1: Sample ADM-Aeolus ascending (red) and descending (blue) satellite passes. The solid lines denote the nadir points directly below the satellite. The dashed curves denote the desired aircraft underflight locations offset 125 n mi (230 km) to the east (ascending orbit) and west (descending orbit) of the satellite nadir.

Flight altitude: 10-12 kft (5 kft is minimum altitude for dropsonde launches).

Leg length or radii: N/A

Estimated in-pattern flight duration: ~20-30 min

Expendable distribution: During the ADM-Aeolus underflight, GPS dropsonde spacing should generally be ~20 n mi (35 km), which will require ~4-8 dropsondes. The sampling frequency can be increased to 10 n mi (20 km) in high gradient areas (e.g., near the TC radius of 34 kt winds or the SAL).

Instrumentation Notes: Use TDR defaults. 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 #1

What to Target: Coordinated underflights of the ADM-Aeolus satellite in the environments of tropical disturbances (e.g., African easterly waves, invests, and TCs) and the SAL.

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When to Target: G-IV flight patterns will be adjusted to coordinate temporal and spatial overlap with overpasses by the ADM-Aeolus satellite. GPS dropsonde and TDR sampling should be timed to be ≤30 min and ≤15 n mi (25 km) of collocated ADM-Aeolus wind and aerosol retrievals and will depend on the area of operation (determined on a case-by-case basis).

Pattern: This is a breakaway pattern that involves a straight-line leg that underflies the ADM-Aeolus satellite and requires an offset of 125 n mi (230 km) from nadir (due to the 35^o scan angle of the satellite's Aladin lidar instrument). The G-IV leg should ideally begin ~10-15 min before and continue for ~10-15 min after the satellite passes "overhead". This will equate to a G-IV leg length of ~140-210 n mi (~260-390 km). NASA's MTS aircraft software should be used to coordinate the underflight.

For ADM-Aeolus satellite *ascending* orbital passes (see Fig. 1):
- ADM-Aeolus crosses the equator (SSE-NNW) at 1800 LST
- G-IV underflight legs will be generally oriented SSE-NNW
- G-IV underflight legs will offset 125 n mi (230 km) to the east of nadir

For ADM-Aeolus satellite *descending* orbital passes (see Fig. 1):
- ADM-Aeolus crosses the equator (NNE to SSW) at 0600 LST
- G-IV underflight legs will be generally oriented NNE-SSW
- G-IV underflight legs will offset 125 n mi (230 km) to the west of nadir

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

Leg length or radii: N/A

Estimated in-pattern flight duration: ~20-30 min

Expendable distribution: During the ADM-Aeolus underflight, GPS dropsonde spacing should generally be ~35 n mi (65 km), which will require ~4-6 dropsondes. The sampling frequency can be increased to 15 n mi (30 km) in high gradient areas (e.g., near the TC radius of 34 kt winds or the SAL).

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.