Flight Scientist Report
Friday 5/21/2021 ACTIVATE RF70

Flight Type: Statistical Survey Flight
Flight Route: ATLIC-ZIBUT-N3700/W06830-ZIBUT-ATLIC
Special Notes: Evidence of smoke aloft

King Air
Pilot report (Wusk): Takeoff 0826 L

Land 1201 L

3.6 hours

Science flight for the UC-12 in support of ACTIVATE, conducted cooperatively with the HU-25. First flight of a planned two-flight day. Departed Rwy08 to ATLIC climbing to FL280. Flew planned route ATLIC-ZIBUT-N3700/W06830-ZIBUT-ATLIC. Desire was to conduct a Process study flight, but conditions were not favorable, so continued on the briefed statistical study profile. Winds were out of the north at ~50kts. Aircraft geolocation was within ~20 nmi throughout the flight, and generally within ~10 nmi during the return westbound leg. All objectives were achieved and no system discrepancies were noted. Aircraft ready for next mission.

Crew was Thorson, Wusk, Harper, Shingler.

Flight scientist report (Harper):

UC12 takeoff 2.5 min after HU25.
Process study canceled for this flight.

Aircraft coordination: within 6min of HU25 thru outbound leg. Within 2min thru inbound leg.

Smoke / Dust mix layer with variable structure from 12kft and above. Scattering and Depolarization decreased as we flew east until we reached cold pool. Upper half of layer depolarization increased east of cold pool.

Stratus Cloud tops 1500 to 1800ft out to ZIBUT
After ZIBUT status dissipated.

MBL remained well mixed.

10min after ZIBUT: shallow cumulus. Clouds elevated. Tops 7200ft. Bottoms at 2500ft.

Pre-cold pool. Clouds topping out at 11.2kft.
Cold pool. Real-time observation from HU25 “Pretty cool aerosol layer”. Sudden depol change in MBL ~3min before turn.

Sonde 1: 13:13:31utc. ~10min before ZIBUT. Foggy Stratus.
Sonde 2: 13:59:28utc. Type A 10 min pre-cold pool
Sonde 3: 14:09:00utc. Cold pool
Sonde 4: 14:23:33utc. Type A post-cold pool
Sonde 5: 15:36:40 ~5min before ATLIC (inbound)

Notes from John during flight based on HSRL-2 data:
Stratus deck off coast. Looks like aerosols just above the deck and likely interacting. I heard that they were collecting lots of water so might big cloud drops. Then it transitions in a slightly less cloudy conditions before turning into the typeA scattered cu. Then the bow wave clouds from the cold pool at the end. Smoke above with possibly dust (higher depol) or this could be ice as well.

Falcon
Pilot report (Baxley):Science flight for the HU-25 in support of ACTIVATE, conducted cooperatively with the UC-12. Departed Rwy08 to ATLIC climbing to 5k ft MSL for initial transit. Research profiles conducted from ATLIC-ZIBUT-N3700/W06830-ZIBUT-ATLIC, from 500’ to 5500’ MSL. Winds were moderate (<20 knots), with clear air until east of ZIBUT and then a scattered layer from 2500’ – 5000’ MSL between ZIBUT and the eastern most point. Both cloud and clear air modules were completed throughout the flight as conditions warranted. Aircraft geolocation was within ~20 nmi throughout the flight, and generally within ~10 nmi during the return westbound leg. All objectives were achieved and no system discrepancies were noted.

Pilots: Slover/Baxley

QNCs: Crosbie/Winstead

Time (L): 0824 takeoff, 1205 land, 3.7 hrs

Log Number: 21F001

Flight scientist report (Crosbie): This flight was launched as a possible process study with stat survey as the back up. The flight included a nice transition in the MBL between a straus MBL over the cold coastal water to a ShCu MBL which included some regions of the “Type B” developed Cu over and near the Gulf Stream. The stratus cloud was capped aloft and in some cases the cloud tops were just above our prescribed MIN for IMC ops. In these cases, the bases

were not reachable so no clear air data could be collected. In order to combat this, BCB legs were run out of sequence whenever there was a break in the clouds and surface visibility was achieved. In the ShCu region, the cloud base rapidly rose allowing normal sampling ops to resume. Near the far end, a region of development was penetrated and on its far side a relatively clear region was found that perhaps may have been associated with a shallow convective cold pool although no clear evidence of mixing or scavenging was seen in the aerosol and/or trace gases. At the turn, a region of development was identified just to the south of the flight track and so a small divert was taken on the return to sample in cloud in this region. These targets would have been excellent for a summer time process study, but were too far out of range to allow sufficient time to work. A high number of cloud water samples (10) were collected in this flight owing to the large duration in cloud (5 full cloudy, 1 part cloudy)

Notes from Eddie:
Prior to takeoff, Wet neph RH at 100%. Had to shut down winds computer & restart to get REVEAL working.

12:29:30 – Humidifier turned on once RH decreased to below 90% in wet neph.

12:35 - @ 5000 ft & scattering increasing along track; Peaked @ just below 30

12:49:45 – Clouds too low to get under

12:59 – Going to statistical survey

13:16:30 – LAS mode around 180 nm; relatively narrow; very few particles below 100 nm

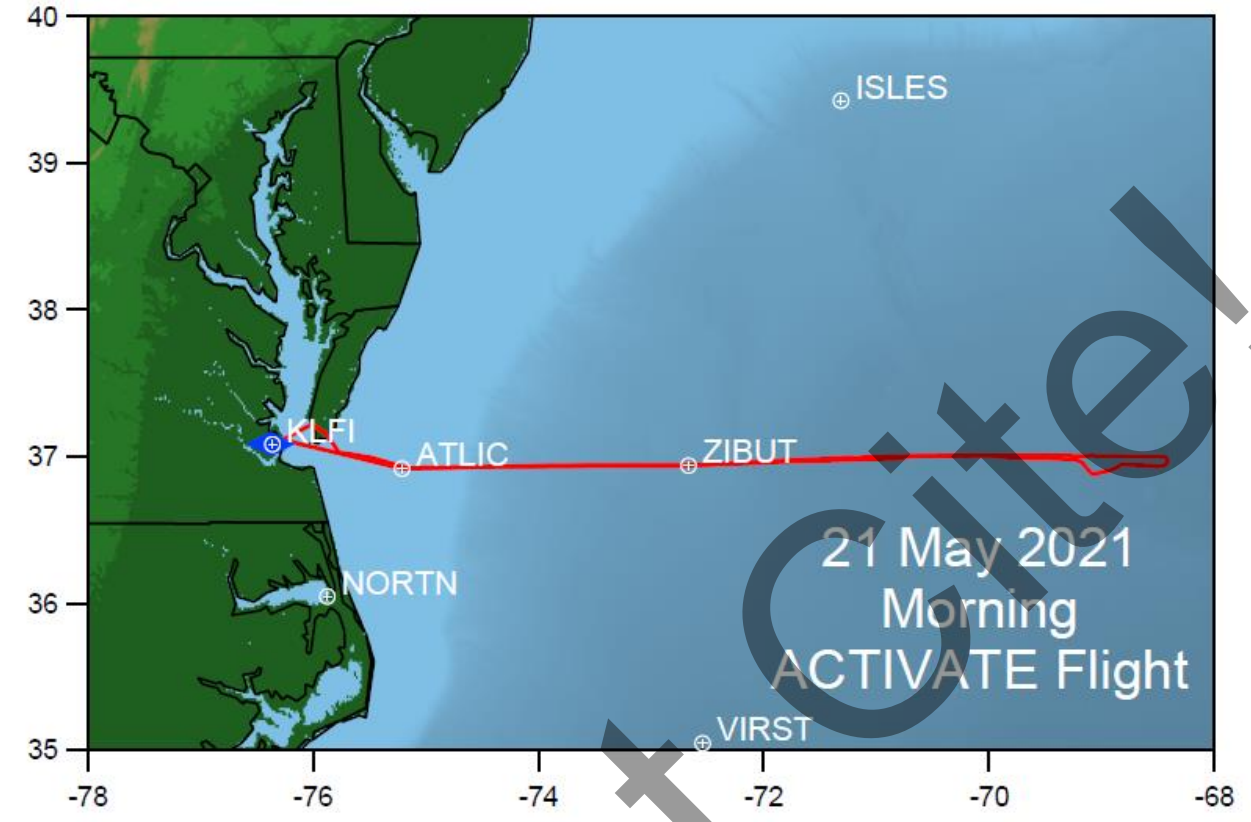
13:29 – Hazy at 500 ft

13:58 - Cold pool

13:59:30 – Rain

15:42:15 – Hot CPC reading <50

15:53:30 Humidifier & WCM turned off prior to landing


ISLES
KLFI
ATLIC
ZIBUT
NORTN
VIRST
21 May 2021
Morning
ACTIVATE Flight
40
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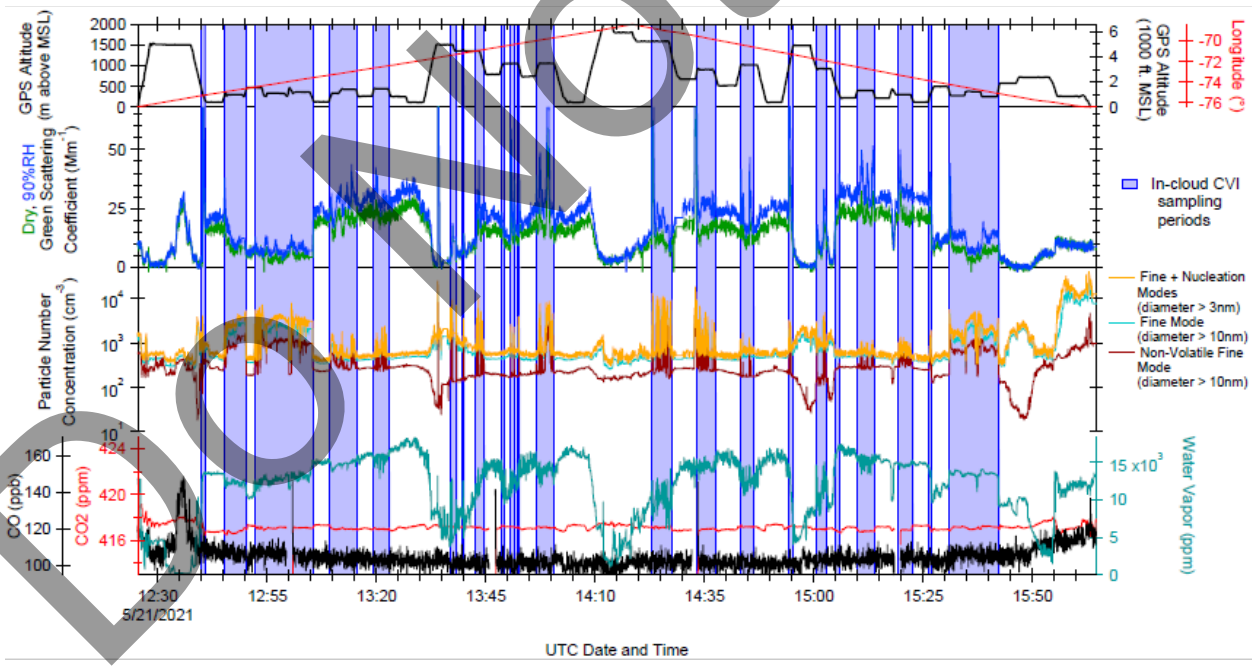
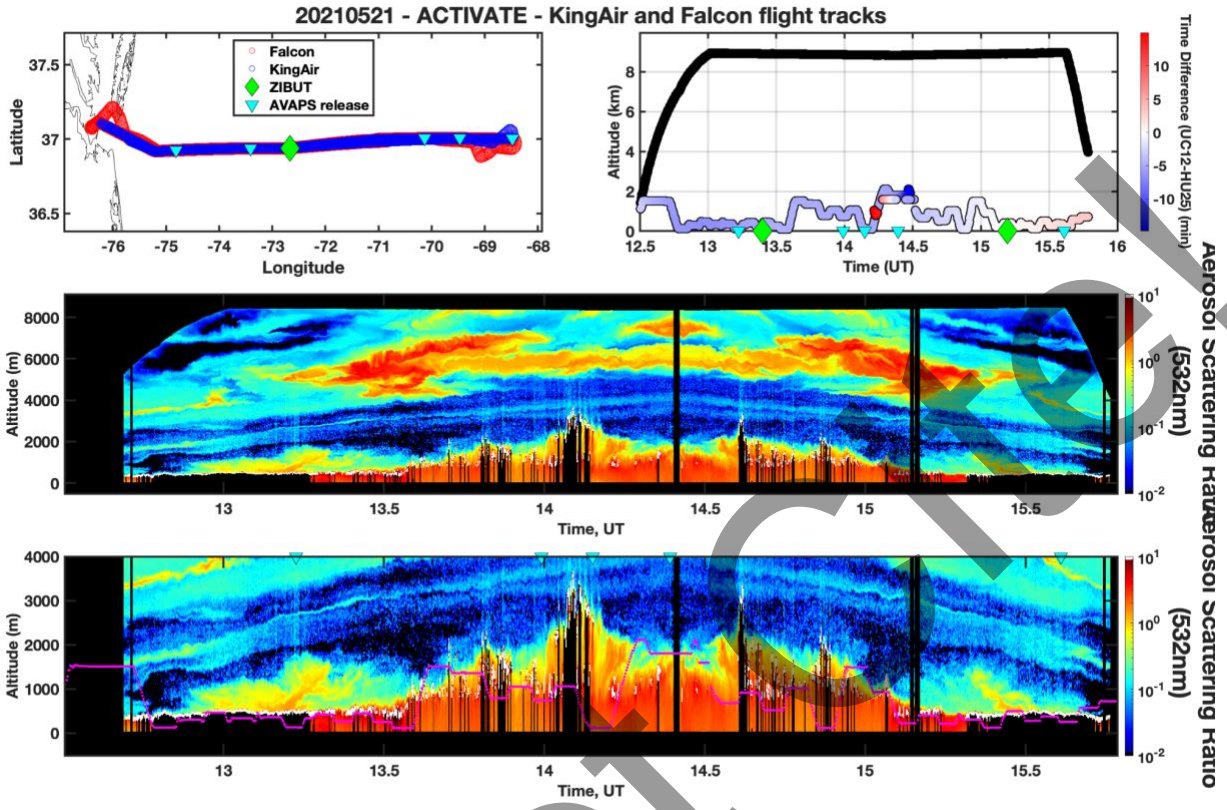
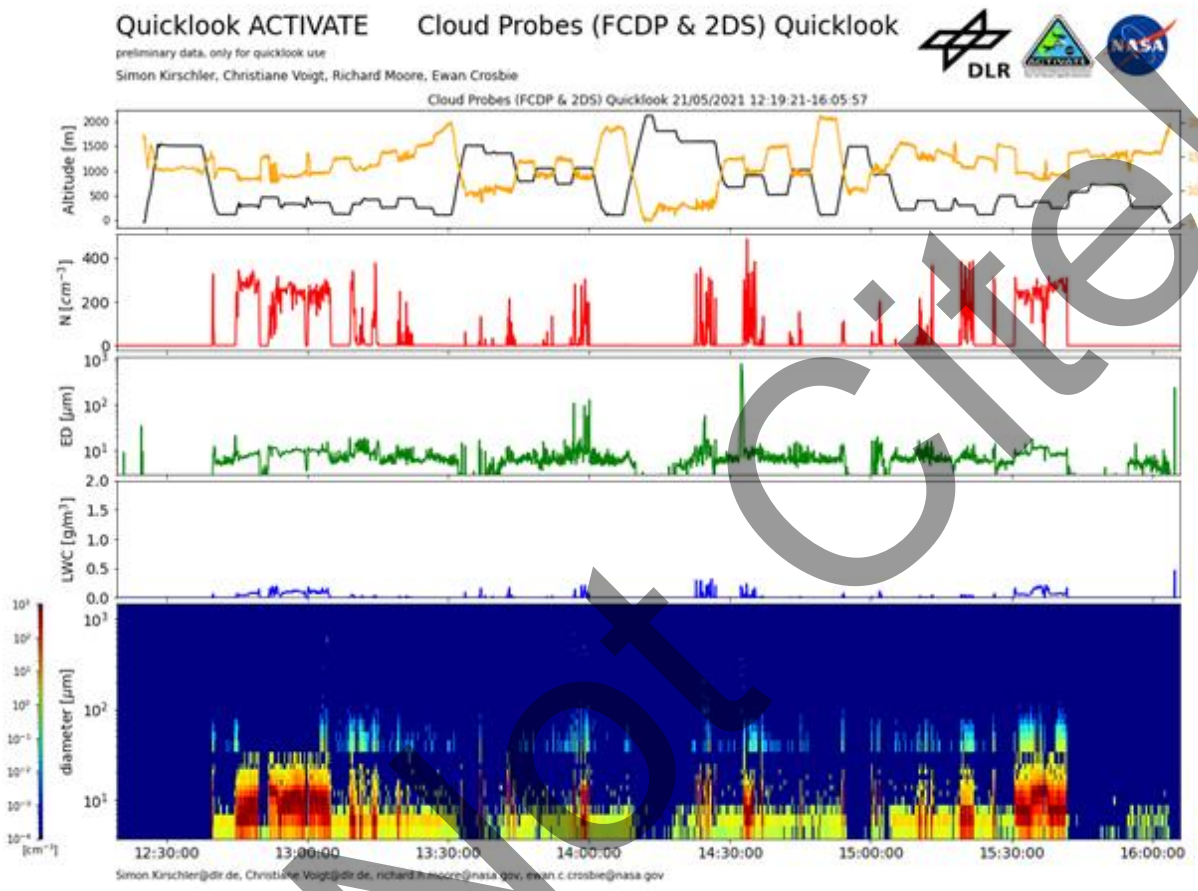
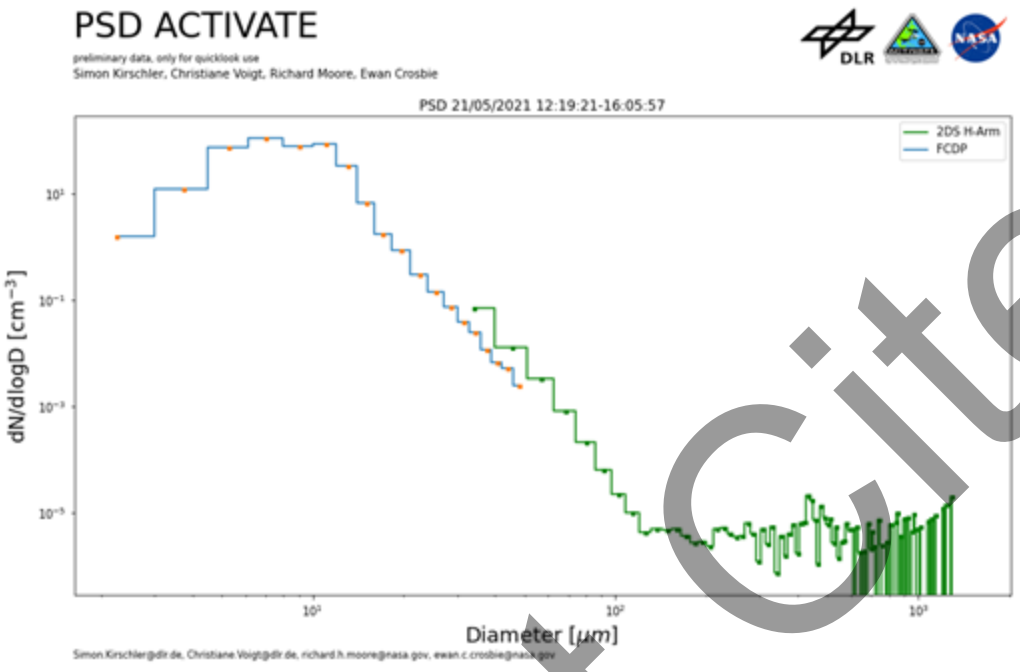
-78
-76
-74
-72
-70
-68

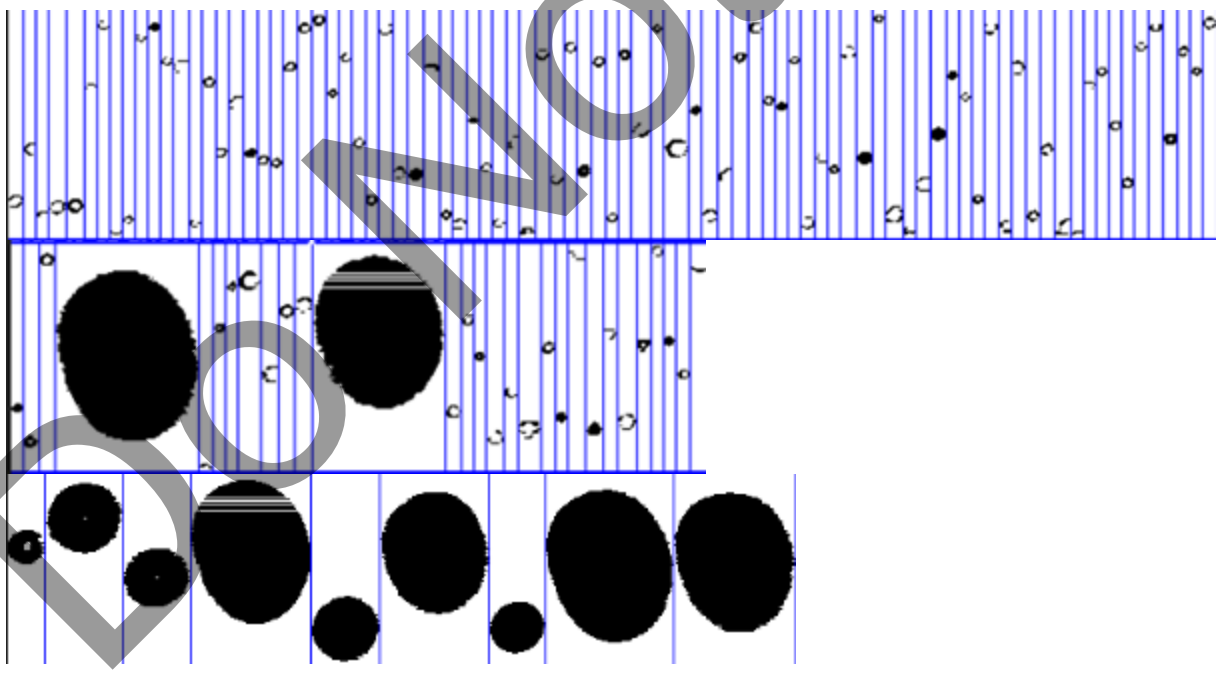

GPS Altitude (m above MSL)
GPS Altitude (1000 ft. MSL)
Longitude (°)
Dry, 90%RH Green Scattering Coefficient (Mm-1)
In-cloud CVI sampling periods
Particle Number Concentration (cm-3)
Fine + Nucleation Modes (diameter > 3nm)
Fine Mode (diameter > 10nm)
Non-Volatile Fine Mode (diameter > 10nm)
CO (ppb)
CO2 (ppm)
Water Vapor (ppm)
12:30
5/21/2021
12:55
13:20
13:45
14:10
14:35
15:00
15:25
15:50
UTC Date and Time



From Marta: This morning's flight included sampling a cold pool. A sonde was launched at 69.46 E longitude at the cold pool location, just past the clouds whose tops are above 2 km (14.09 UT).


Quicklook ACTIVATE
Cloud Probes (FCDP & 2DS) Quicklook
preliminary data, only for quicklook use
Simon Kirschler, Christiane Voigt, Richard Moore, Ewan Crosbie
DLR
Cloud Probes (FCDP & 2DS) Quicklook 21/05/2021 12:19:21-16:05:57
Altitude [m]
N [cm⁻³]
ED [µm]
LWC [g/m³]
diameter [µm]
[cm⁻³]
12:30:00
13:00:00
13:30:00
14:00:00
14:30:00
15:00:00
15:30:00
16:00:00
Simon.Kirschler@dlr.de, Christiane.Voigt@dlr.de, richard.h.moore@nasa.gov, ewan.c.crosbie@nasa.gov

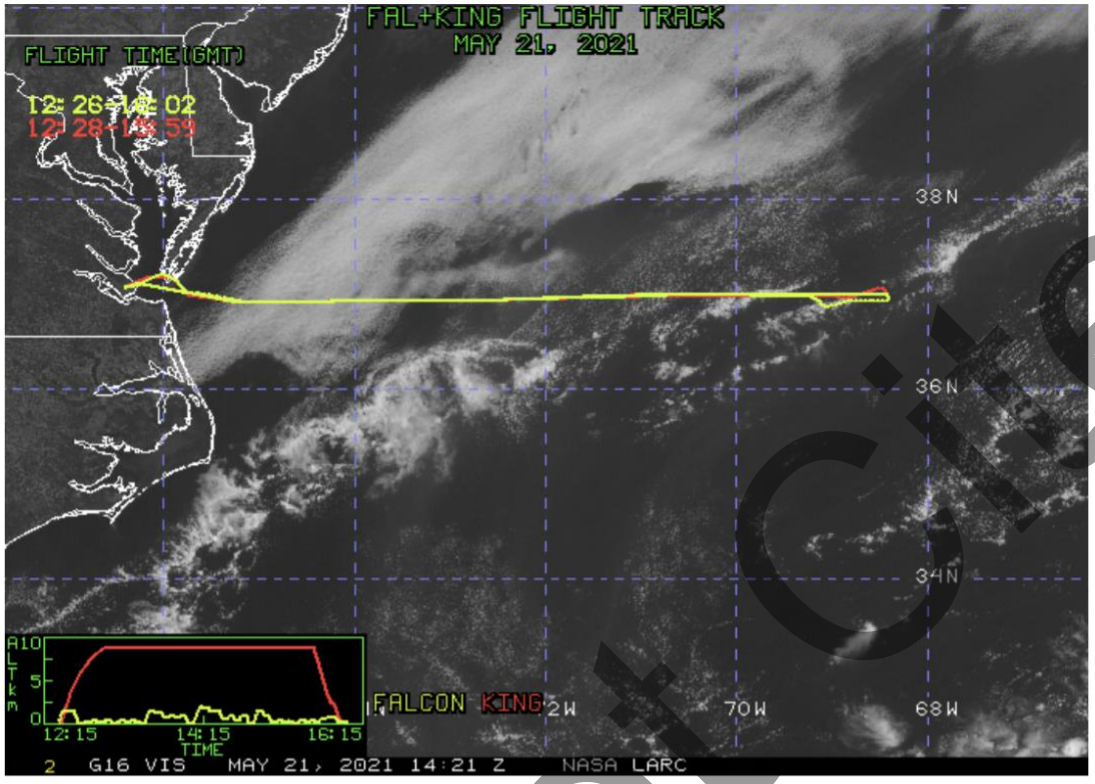




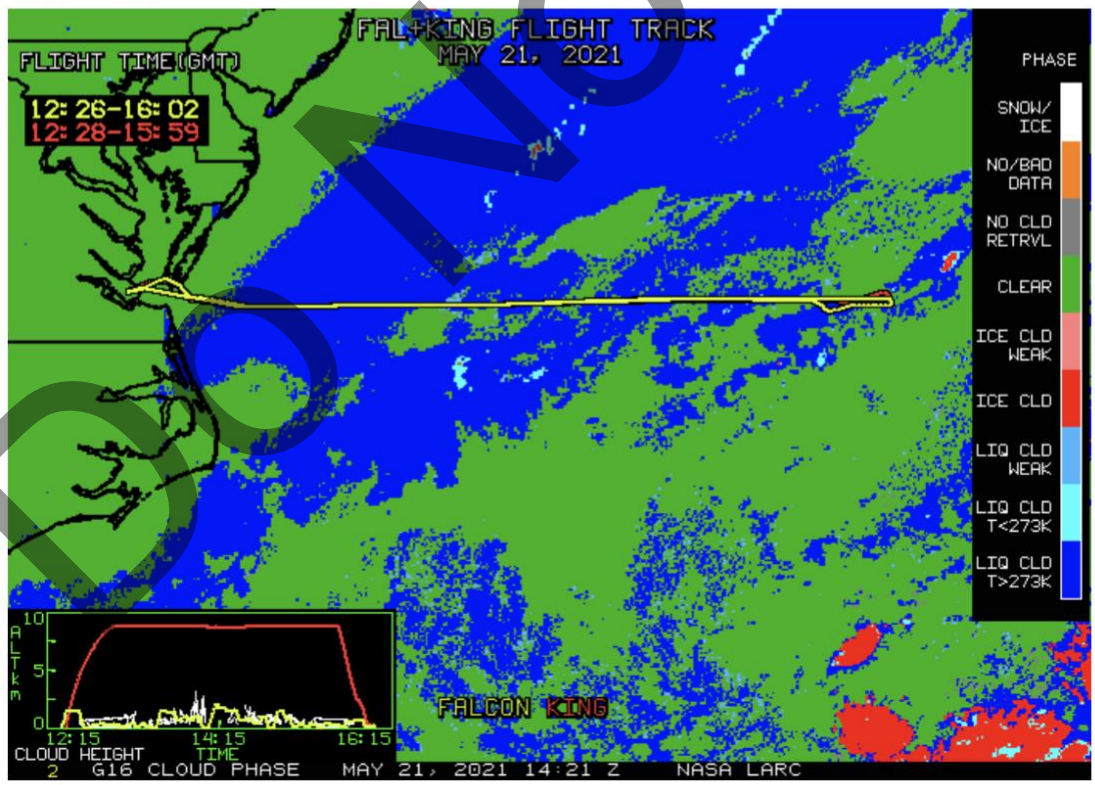
Pure liquid clouds with precip ~ 14:00 to 14:35 UTC

NASA-LaRC Clouds Group GOES-16 Quicklook Images for Flight 70, 14:21 UTC May 21, 2021

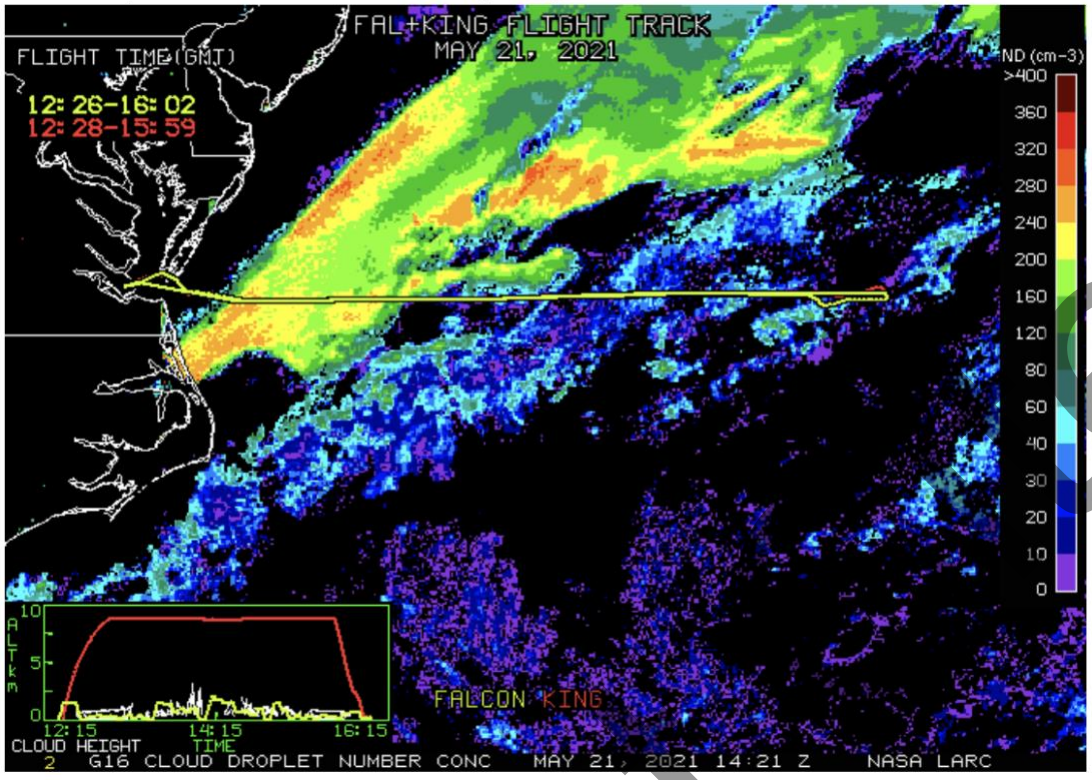
Visible Image



Cloud Phase



Cloud Droplet Number Concentration (cm-3)



Cloud-Top Height (Kft-ASL)