Flight Scientist Report
Friday 4/2/2021 ACTIVATE RF60

Flight Type: Statistical Survey Flight
Flight Route: KLFI KECG OXANA 3245N07145W OXANA KECG KLFI
Special Notes: 1st flight of a 2 flight day. These are some unique cold air outbreak conditions where the strength of the CAO index values is thought to be closer to coast than usual. Both flights today are flying the exact same path with more dropsondes than normal to really try to capture spatial and diurnal atmospheric behavior.

King Air
Pilot report (Sandeen): Science flight for the UC-12 in support of ACTIVATE Campaign #3, conducted cooperatively with the HU-25. Departed Rwy26 to ECG climbing to 4k ft MSL, followed by left turn to climb to FL270. Research profiles conducted from KLFI-ECG-OXANA-3245N/07145W-OXANA-ECG-KLFI. Winds at altitude varied, but were generally 80-100 from the SSW, so primarily a crosswind during overwater portions, with lighter winds observed near the coast. UC-12 remained clear of clouds for the entire flight, except for a short transit through a cloud at about 5,000 ft during the RTB portion near KLFI. HU-25 was generally within 10 nm during the sortie, and HU-25 performed all turns/360's to keep the aircraft near each other due to the higher TAS of the HU-25. All objectives were achieved and no system discrepancies were noted - pending post-flight data analysis. 9-10 dropsondes were released during the flight.
Pilots: Jamison/Sandeen QNCs: Shingler

On the first flight there was one potential maintenance issue with the aircraft involving propeller RPM, but the issue did not repeat itself and the aircraft was determined to be up for a second flight.

Flight scientist report (Shingler): The cloud scene on RF060 was more dynamic than typical, with cloud tops ranging from 1 km near the coast to ~3 km near the end of the track with many layers (as viewed from the lidar) throughout the track. A notable dust layer was seen above the cloud deck, at an altitude of ~6km near the coast, thinning and descending down to just above cloud tops (~4km) near the end of the track. It appeared that there may have been more precipitation in today's sortie than in previous. All instruments were operational and 9 sondes were dropped along the track (*in order:* midpoint between coast/OXANA, OXANA, mid OXANA/end, end, mid end/OXANA, between midpoint and OXANA (¾ of the return leg back to OXANA), OXANA, mid between OXANA and coast, coast).

Falcon
Pilot report (Delaney):

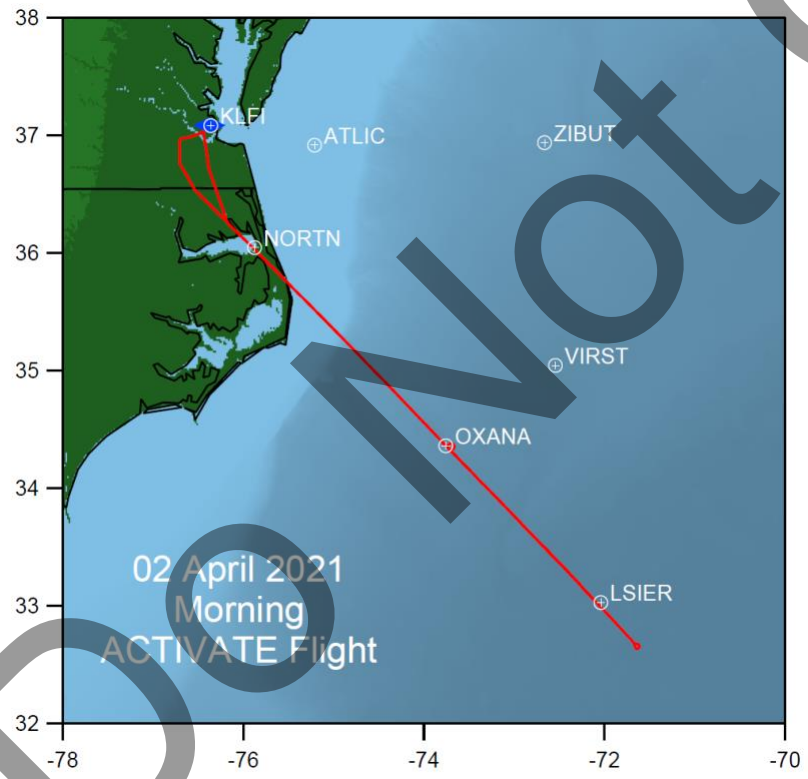
Takeoff: 0832 Land: 1202 Flight Time: 3.5

Science flight for the HU-25 in support of ACTIVATE Campaign #3, conducted cooperatively with the UC-12. Departed Rwy26 to ECG climbing to 5k ft MSL for initial transit. Research profiles conducted from KLFI-ECG-OXANA-3245N/07145W-OXANA-ECG-KLFI. Winds were light (~20 knots) from the Northwest throughout the majority of flight altitudes with a scattered layer initially encountered at ~4-6 k FT MSL (around ECG), followed by more complex layers increasing in thickness approaching OXANA and extending out to the turn-point. Predominantly all cloudy-based modules conducted throughout the flight, ranging from 500 – 11,500 FT MSL. Some occasional light icing was encountered during cloud penetrations above the freezing level, and continuous light-chop turbulence was present at nearly all altitudes. Aircraft geolocation was within 10 nmi throughout the sortie, with a climbing 360-degree turn at OXANA during an ACT setup for timing adjustment and an extension beyond the turn-point (~10 nmi) during a minimum altitude run for geolocation compensation. All objectives were achieved and no system discrepancies were noted - pending post-flight data analysis.

Pilots: Elder/Delaney
QNCs: Crosbie/Winstead

Flight scientist report (Crosbie): (applies to both flights of the day here at once)

- Deep, cold air outbreak conditions
- Cumulus clouds were present over land in addition to the marine clouds, the cumulus built during the day and was a bit more widespread in the second flight. A reduction in the cloud base was observed from Langley to OBX coastline.
- Clouds thickened rapidly offshore within the first 10 km, and eventually transitioned to a stratiform shield that had tops between 8000 and 11000 ft MSL. Mixed phase microphysics were observed in the cold sections of the cloud. Even shallow cumulus closer to shore contained some evidence of ice particles. The melting level was quite close to cloud base further to the SE and widespread sub cloud rain/drizzle was observed. A marked reduction in the Nd was observed downwind.
- Icing was generally not a concern during the first flight but on the second flight, the first descent over water took place in a particularly thick section of the cloud at around the minimum in cloud top temperature and caused significant icing on the instrumentation resulting in loss of functionality in the TAT probe which appeared to persist beyond the time when the ice was cleared.


38
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32
-78
-76
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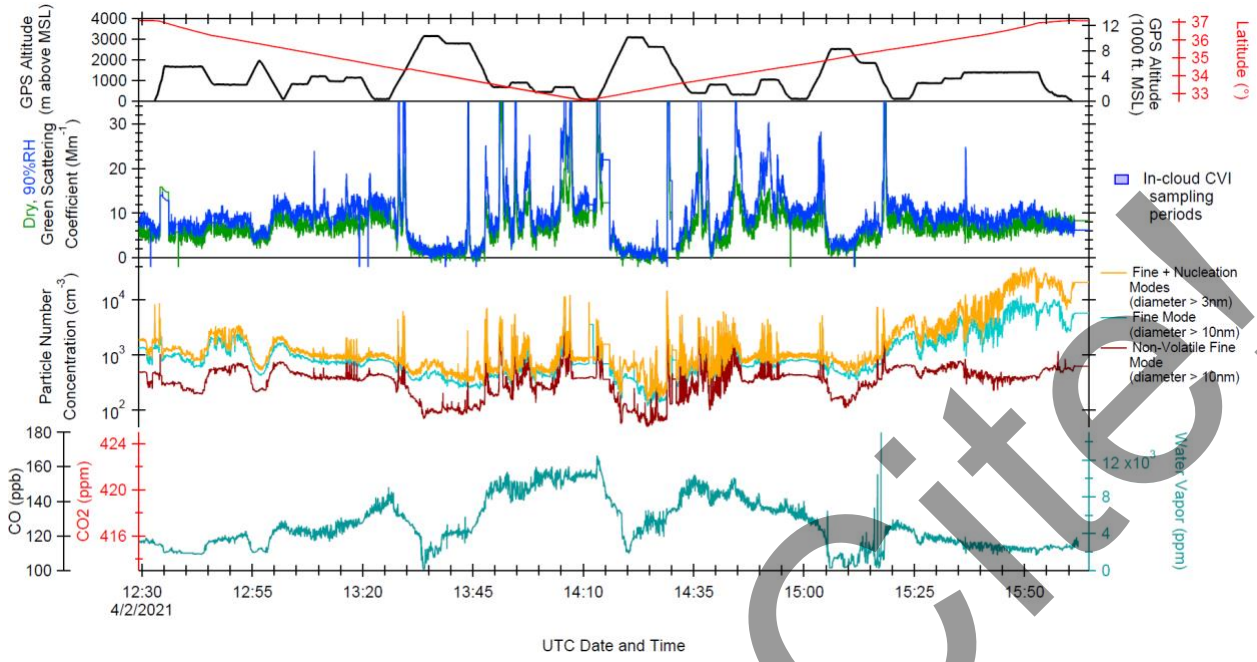
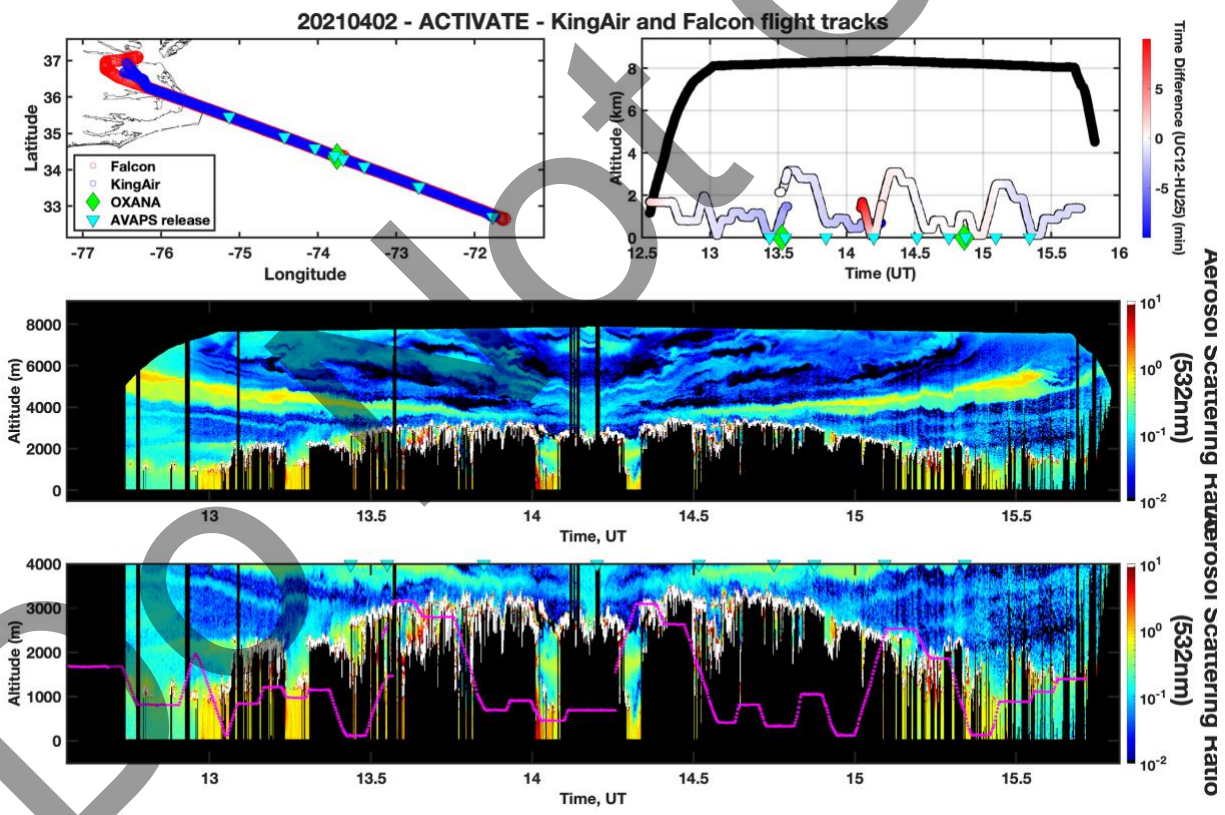
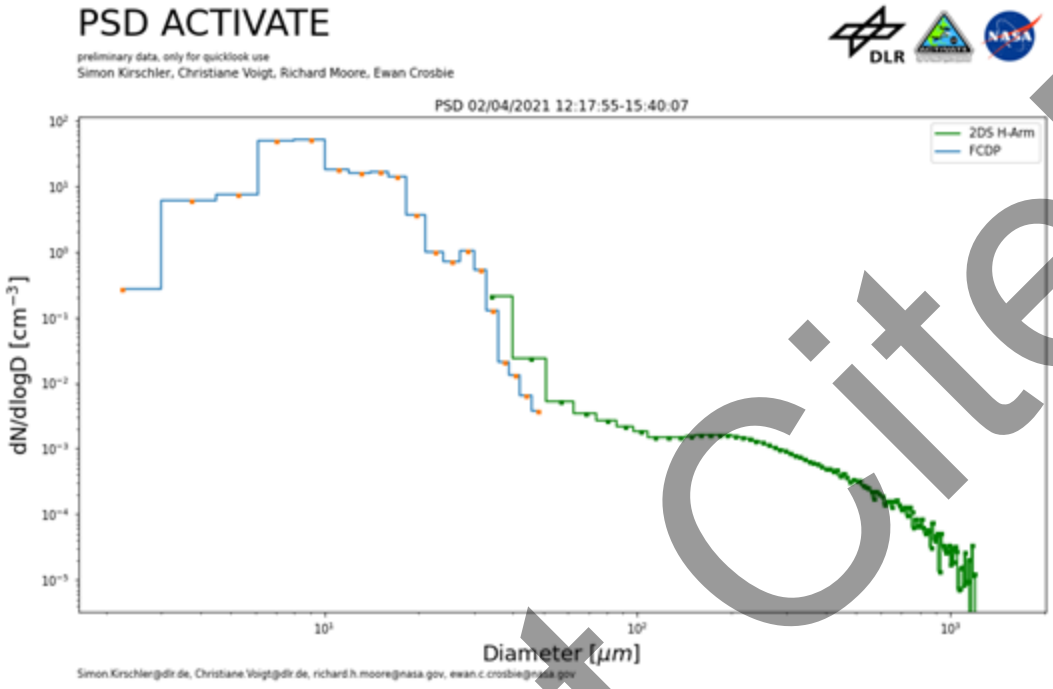
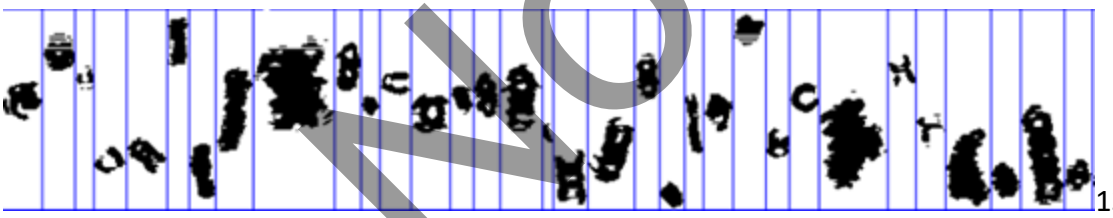
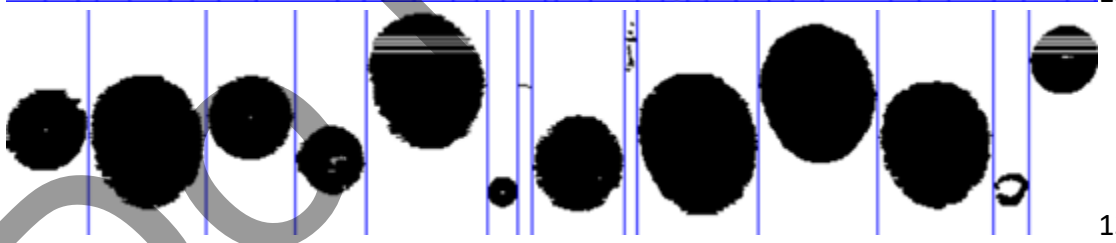
-72
-70
KLEF
ATLIC
ZIBUT
NORTN
VIRST
OXANA
LSIER
02 April 2021
Morning
ACTIVATE Flight


GPS Altitude (m above MSL)
GPS Altitude (1000 ft. MSL)
Latitude (°)
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
4/2/2021
12:55
13:20
13:45
14:10
14:35
15:00
15:25
15:50
UTC Date and Time

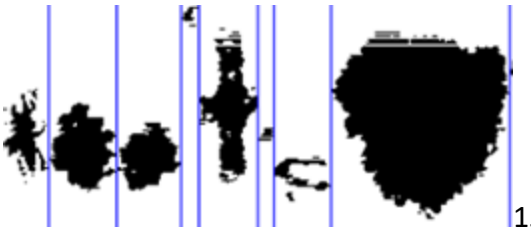

20210402 - ACTIVATE - KingAir and Falcon flight tracks
Latitude
Longitude
Falcon
KingAir
OXANA
AVAPS release
Altitude (km)
Time (UT)
Time Difference (UC12-HU25) (min)
Altitude (m)
Time, UT
Aerosol Scattering Ratio (532nm)




13:39 UTC


13:50 UTC

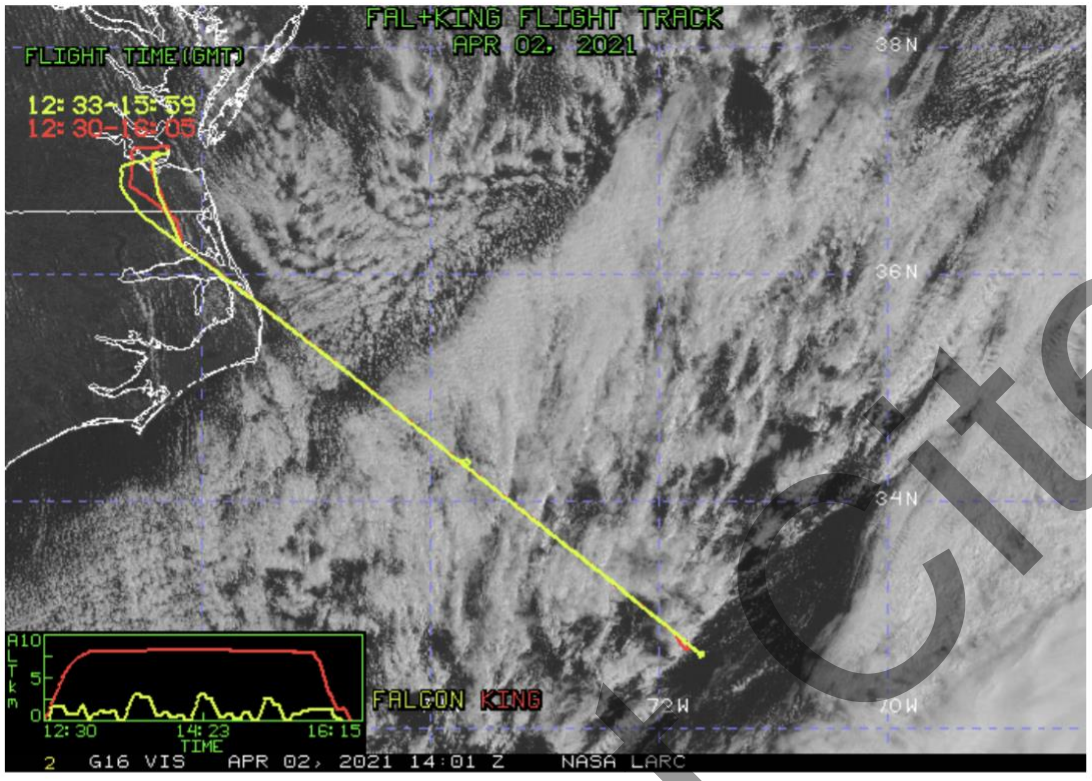

14:16 UTC


15:17 UTC

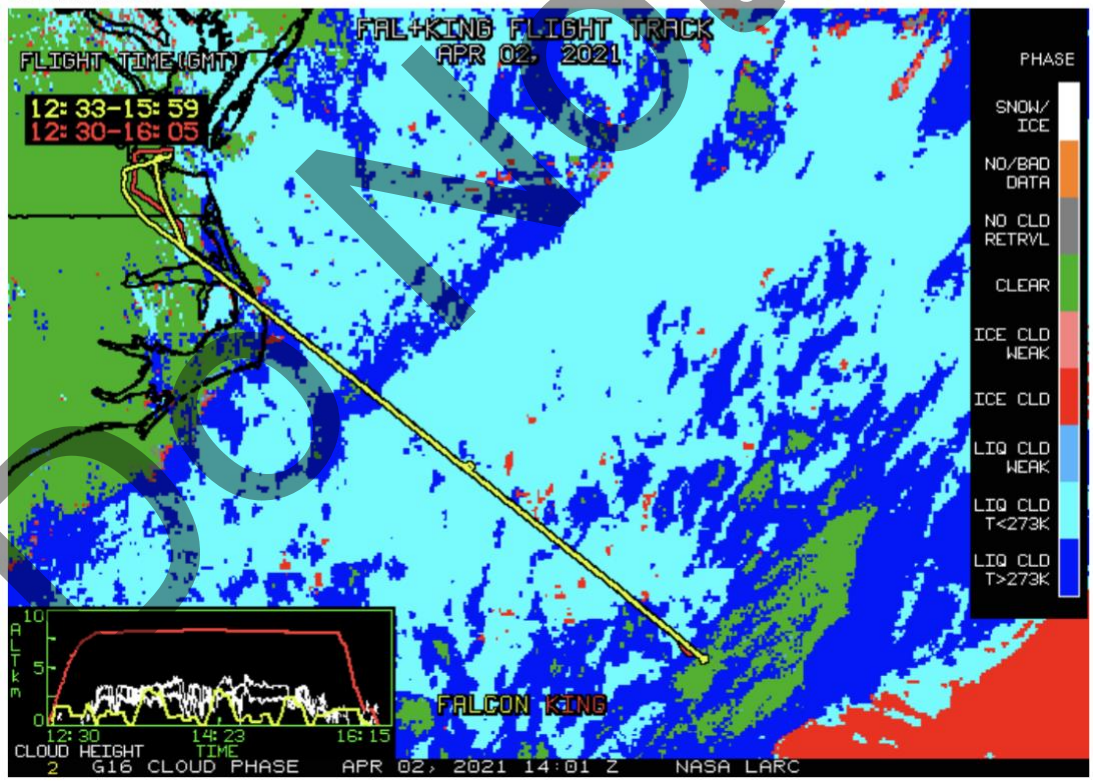
Mixed phase clouds and pure liquid clouds.

NASA-LaRC Clouds Group GOES-16 Quicklook Images for Flight 60, 14:01 UTC Apr 02, 2021

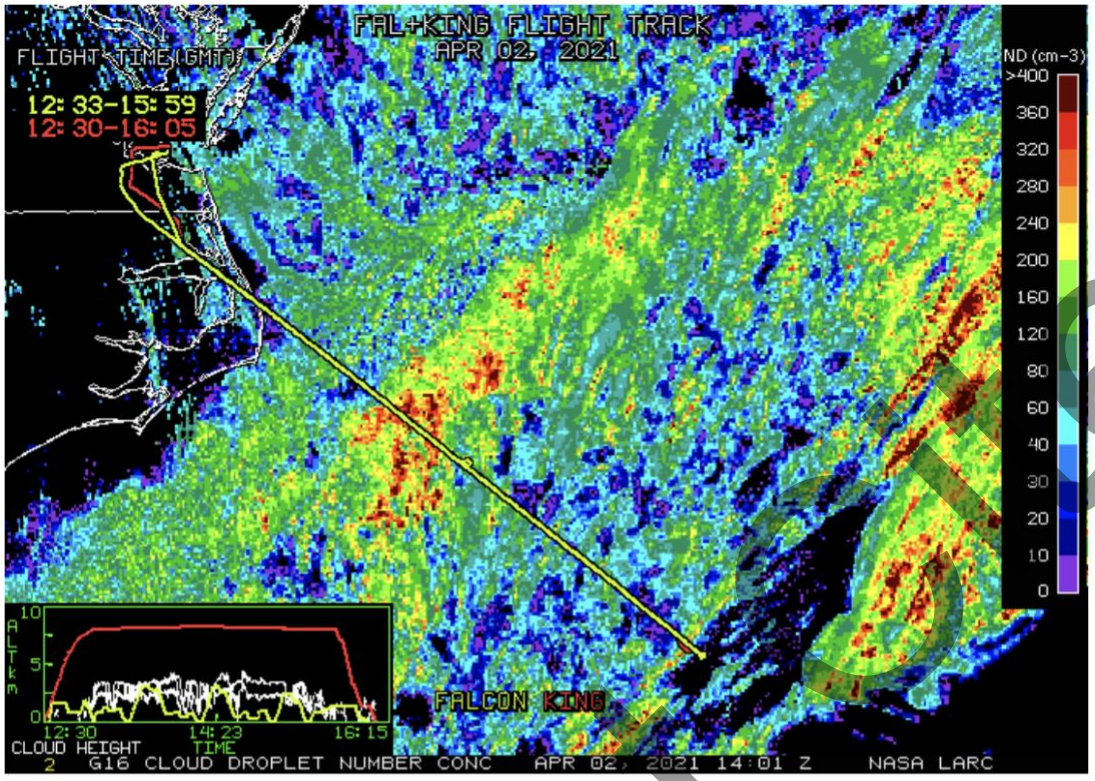
Visible Image



Cloud Phase



Cloud Droplet Number Concentration (cm-3)



Cloud-Top Height (Kft-ASL)