ORACLES P3 Flight Scientist Post-Flight Status

Date: _____10 October 2018_____

Flight number: ____PRF07Y18_____

Routine flight or target of opportunity? _____routine_____

If target of opportunity, what is the goal? _____

Flight scientist: _____Paquita Zuidema/Michael Diamond AFS_____

Ground scientist: _____Sarah Doherty_____

Take-off: ____08 UTC_____

Landing: _____ 14:57UTC_____

Quick summary:

Representative ACAOD or ACAOD range for flight: __max AOD of _____

Do the models predict crossing a gradient in aerosol age? Yes

Did the flight cross a gradient in macroscopic cloud properties, like cloud fraction? Yes but all boundary layer sampling was in cloud

Did the flight cross a gradient in aerosol loading? Yes. Dominant loading at

At any point during the flight, was there a clear separation between the smoke plume(s) and cloud tops? Clouds clearly polluted according to SEVIRI Nd

How many of the following maneuvers took place?

Ramps _____

Square spirals _____

MBL legs ____3_____

Cloud legs _____

Above cloud legs _____

Sawtooth legs _____

Plume legs _____

Above plume legs _____

Instrument status:

Instrument	Comments
P3	Healthy. A roll problem on occasion; see RSP comments
4STAR	Good. 0.48 max at 13S. 0.5
HiGEAR	Healthy. Nothing major went wrong. 1st in-cloud run was wonderful. Tried new in-cloud sampling techniques
HiGEAR-AMS	Healthy. Good in-cloud data. Tried out a high-frequency low-sensitivity"W-mode" sampling strategy in cloud.
HSRL-2	Fantastic day.
RSP	Fine. Cirrus present at end of day which was unfortunate. Roll problem at one point reasserted itself, through an automatic trigger, helpful to call pilot's attention to it.
APR3	New data product presented during the flight. Radar worked well
Cloud probes	Good in-cloud speed legs (4 speeds: 280,250,210,180 knots). No cloud CAS data.
CCN	Problem with scanning mode, could only be run manually. CCN run in a constant mode of 0.3% SS but scanning also done manually. 1800 CCN
PDI	Worked great.
Vertical winds	All good
WISPR/CVI	Flow was not being adjusted correctly on the CVI, and all HiGear and isotope data sampled off of the CVI for this flight is incorrect and non-recoverable. This was recognized post-flight.
COMA	Highest CO in BL of whole mission. Worked well.
SSFR	No issues. Zenith light collector issue solved previously.
data	Worked well
PTI&SP2	PTI: green channel working at one-half sensitivity. Interferometer worked well. Blue channel half-power signal as in previous flights. SP2 good.

PRF07 10 October 2018 Mission Report

flight scientist/assistant flight scientist: Paquita Zuidema/Michael Diamond
ground scientist: Sarah Doherty

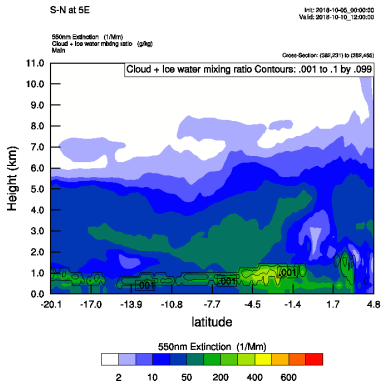
flight plan and objective: routine flight plan to 13 S along 5 E. 3 samples of polluted boundary layer allow for possibility of Lagrangian sampling on 12 October

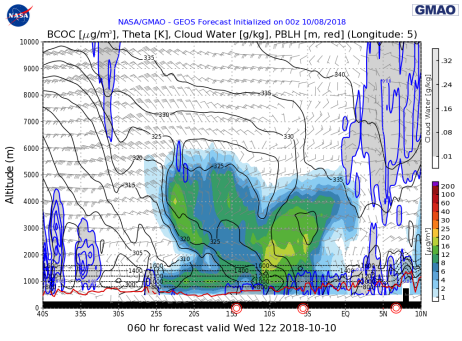
Description of Legs

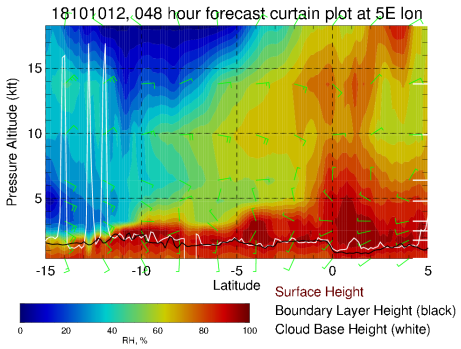
1) High-altitude transit to 13 S
2) Square spiral to near-surface at 13S
3) 200 ft above cloud northbound for 5 minutes, level leg southbound in-cloud speed runs for cloud probes, 200 ft above surface northbound
4) ascend to aerosol layer 13kft between 9-10S, 15- minutes
5) descent at ~7.5S to 5 kft altitude
6) long boundary layer sequence: dull sawtooths, boundary layer level leg across clear slot, 3 sharp sawtooths
7) ascent to ~9 kft for aerosol leg
8) ascent for a higher-altitude leg
9) spiral down to near-surface at ~4.5S, cloud level leg
10) ascent to ~8 kft
11) ascent to high-altitude and transit home.

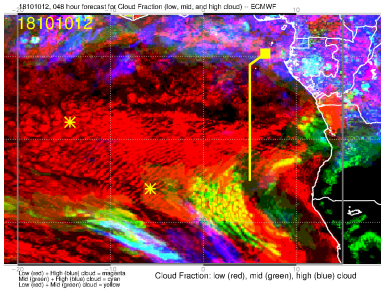
Notable features: aerosol at southern end reached up to 19.5 kft, encouraging plane to rise to 20 kft to be above it. sampling of polluted boundary layer.

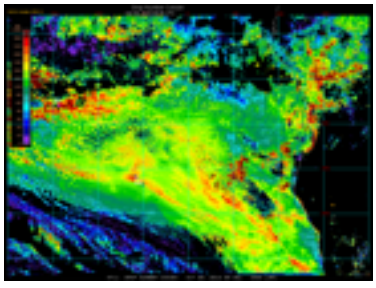
A-Priori Outlook

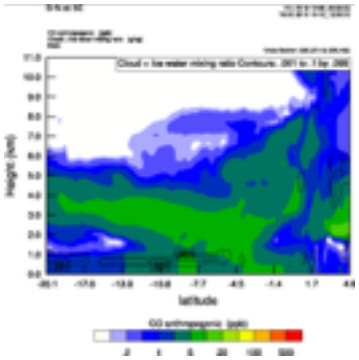












notable features, cont.:
aerosol max somewhere between 5-10S in models
weaker humidity outflow south of 10S
SEVIRI Nd from 9 October shows polluted boundary layer over entire southeast Atlantic

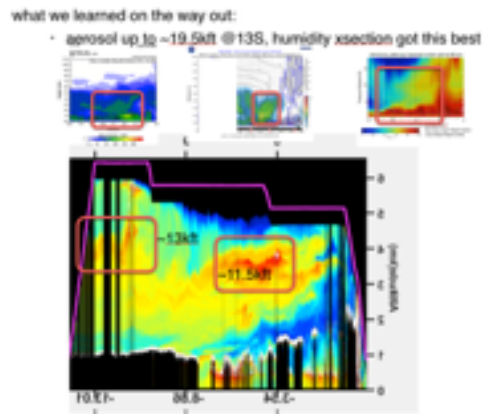
- yesterday's SEVIRI Nd image suggests polluted boundary layer should continue
- may see higher clouds @ S end of track
- significant differences between the model aerosol spatial distribution, but all place most aerosol N of 10 SHSRL curtain along transit to 12S indicates main aerosol plume located further south than in WRF-AAM. higher aerosol layer completely missed in WRF-AAM

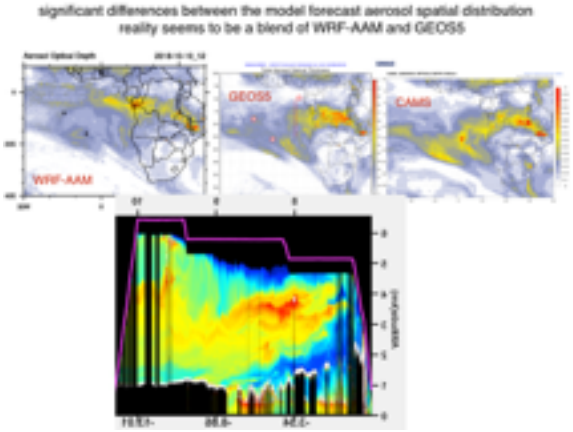
Runtable

description	beginning time (UTC)	end time (UTC)	altitude	notes
takeoff	6:58			ascent through mixed-phase cloud leveled at 16kft which put us out of cloud. cloud probes seeing columns
ferry leg to 13S	7:24	9:44	16-18-20kft	up to 18 kft @ 8:05. oscilations at 7:57 UTC in in-situ data. ACAOD~0.3 at 4S. WRF-AAM nails the northern placement of the main aerosol layer between 3-4S if missing the gap above cloud. mid-level cloud @ 8utc embedded in smoke, ~3.75km. aerosol begins to touch cloud layer at 6.5S. went up to 20 kft at ~9:23utc
square spiral @ 13S	10:00	10:18	started at 20 kft	preceeded by 3-minute overshoot for RSP and lidar calibration. aerosol layer reaching 19kft. max aerosol @ 3.75-4km. rose particles @ 9kft.hit cloud 10:16:55. ACAOD of 0.48
immediately to above-cloud leg level leg speed runs going southbound near-surface leg N	10:27 10:38 10: 10:49	10:32 10: 10: 10:56	- —	280 knts is first speed,then 250,210,180 ends in clear sky
aerosol plume leg	11:10	11:25	13.7kft	12S-10.2S
aerosol plume leg	11:33	11:43	4.5kft	low ASR/elevated depol layer

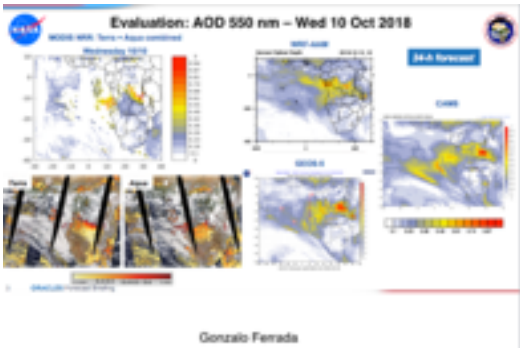
description	beginning time (UTC)	end time (UTC)	altitude	notes
dull sawtooths	11:46	11:29		2minute legs below and above clouds by 200 ft
500 ft leg	12:05	12:15		polluted,clearslot
3sawtooth	12:15	12:30		250-300/cc
2minute abovecloud leg	12:33	12:35		ACAOD of 0.35
aerosol plume	12:44	13:01	11.5kft	
up to 19kft,southbound for 5 minutes	13:09	13:14		lightly polluted
square spiral	13:15	13:35		cirrus above; mostly just in-situ lidar intercomparioson. ~4.5S
2-minute sub-cloud leg cloud level leg	13: 13:	13:59		CO~110/ppb
above-cloud 4-minute leg	13:59	14:03		
aerosol plume	14:10		11kft	
high-altitude	14:23		19kft	
landing	14:56:23			

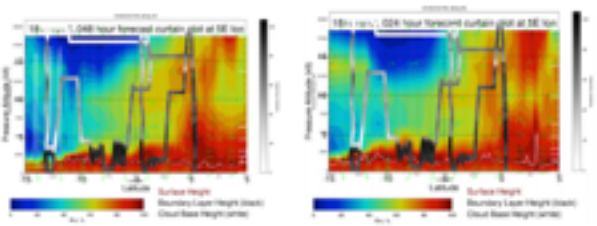
Notes: from slides at 11 Oct ST tag-up





in-flight assessment of model RH

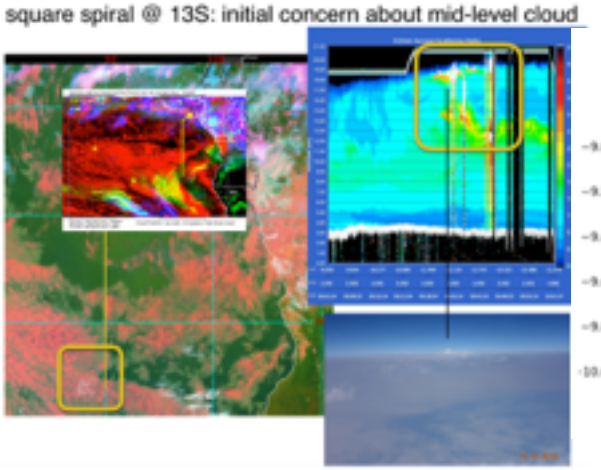




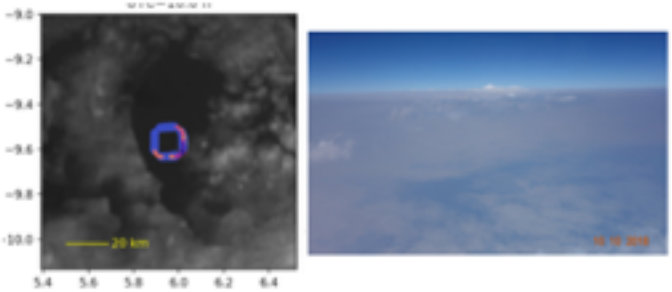
moisture in nature present higher in the atmosphere than in even the RH forecast

note RH distribution between 0-5kft

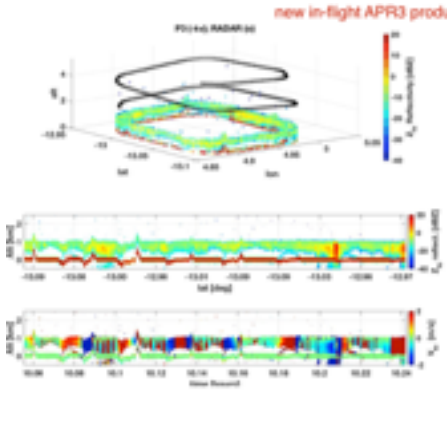
square spiral @ 13S: initial concern about mid-level cloud

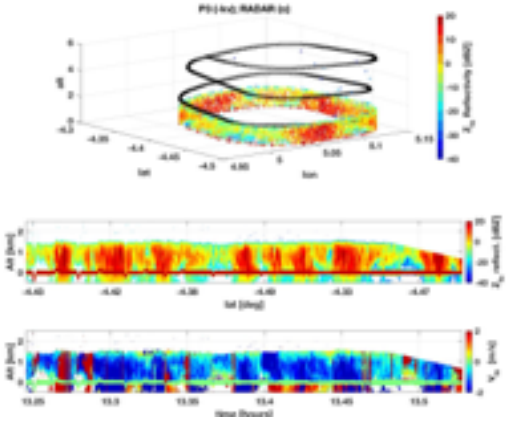


visibility from cockpit ~7km in any direction
spirals are ~10 km to a side
=> if not visible from the cockpit, you should be okay



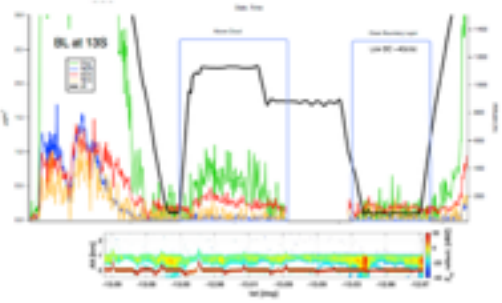
new in-flight APR3 product



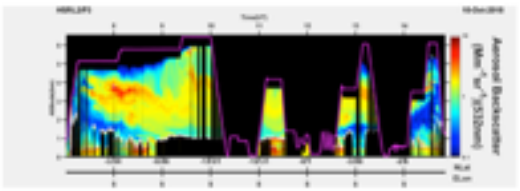


at the bottom of the spiral @ 13S:
CO~100-110 ppb, rBC~40 c/cc
organic aerosols~ 0.5/m^3
cloud droplet numbers of 130/cc

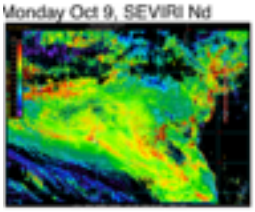
dry slot above cloud but aerosol present



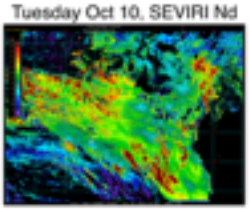
sampled boundary layer twice more on way north ~7.5S ~3S

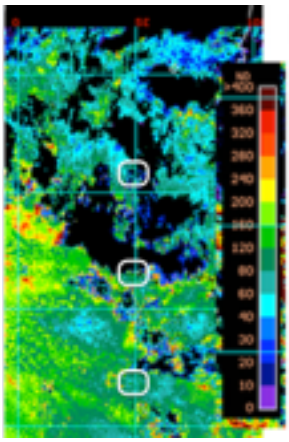


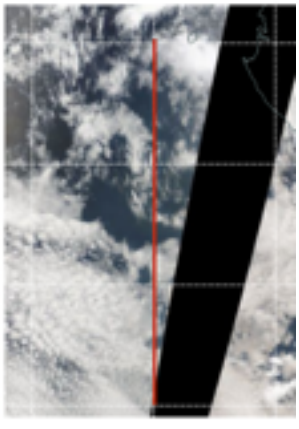
Monday Oct 9, SEVIRI Nd

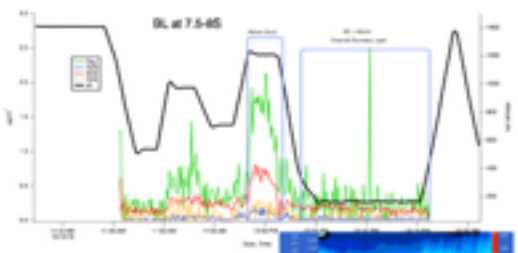


Tuesday Oct 10, SEVIRI Nd

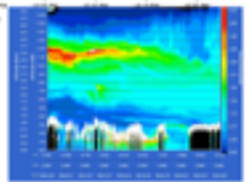


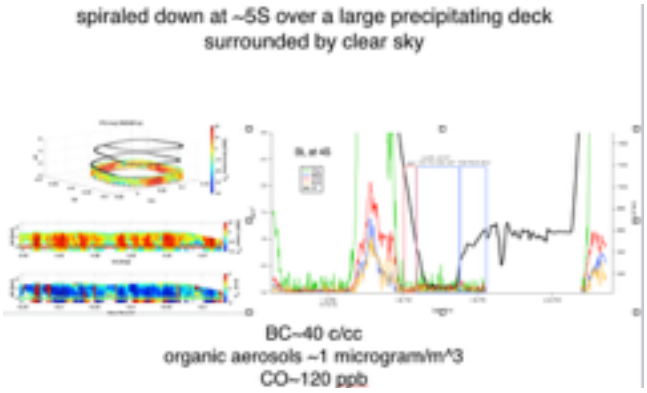






CO~110-125 ppb
rBC~140 c/cc
organic aerosols~ 1microgram/m^3
cloud droplet numbers of 250-300/cc





notes, from Sarah Doherty:

icing/ice particles towards erego
2nd (3rd?) photo @ 7:52 UTC. stratocu
nxt photo+1 @ 8:16. linear roll clouds below
photo during 13S spiral
vertical oscilations in lidar @ 7.2S to 8S

clear slot at 7.4S to 8S
precipitating clouds beginning at 9S
aerosol touching cloud 8-10, less aerosol S of 10S touching cloud
went up to 20kft to be above the aerosol. embedded mixed-layer clouds, seen by APR
13S depol ratio above cloud elevated, tony thinks its real
rose particles at 9kft, depol picking up

blue circles indicate locations of MBL sampling