

## ORACLES P3 Flight Scientist Post-Flight Status

Date: \_\_\_\_27 September 2018\_\_\_\_\_

Flight number: \_\_\_\_PRF01Y18\_\_\_\_\_

Routine flight or target of opportunity? \_\_\_\_routine\_\_\_\_\_

If target of opportunity, what is the goal? \_\_\_\_\_

Flight scientist: \_\_\_\_\_Paquita Zuidema\_\_\_\_\_

Ground scientist: \_\_\_\_\_Michael Diamond\_\_\_\_\_

Take-off: \_\_\_\_0816 UTC\_\_\_\_\_

Landing: \_\_\_\_1500 UTC\_\_\_\_\_

### Quick summary:

Representative ACAOD or ACAOD range for flight: \_\_max AOD of 0.65-0.7\_\_\_\_\_

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 12S**

At any point during the flight, was there a clear separation between the smoke plume(s) and cloud tops? **Most clear gap was at southern end but unsure 'gap' was completely clean**

### How many of the following maneuvers took place?

Ramps \_\_\_\_\_

Above cloud legs \_\_\_\_\_

Square spirals \_\_\_\_\_

Sawtooth legs \_\_\_\_\_

MBL legs \_\_\_\_3\_\_\_\_\_

Plume legs \_\_\_\_\_

Cloud legs \_\_\_\_\_

Above plume legs \_\_\_\_\_

### **Instrument status:**

<b>Instrument</b>	<b>Comments</b>
P3	healthy
4STAR	Good. Max aod of 0.7. lots of skyscans.
HiGEAR	Pre-flight: One neph bulb burned out; hygrometer not working. Post:Humidity controller problem resolved. Leak problem resolved. Scattering > 100/Mm. ~10 minutes
HiGEAR-AMS	Good CVI data. All good.
HSRL-2	good.
RSP	All good. Solar geometry in favor. Computer got warm, would have liked a cooler cabin.
APR3	Went well.
Cloud probes	HVPS computer not responsive
CCN	All good. No clogging unlike last year.
PDI	Noise on HF initially. Good data later.
Vertical winds	All good
WISPR/CVI	CVI flawlessly. Spare instrument swapped in had a bit of a problem but will fix
COMA	Good flight.
SSFR	1) Platform wouldn't go through its startup routine preflight. A few hours into

	flight the leveling platform started working. Attributed to condensation that eventually evaporated. 2) issue with the zenith data collector optics
<b>data</b>	Worked well. Working on fixing humidity.
<b>PTI&amp;SP2</b>	PTI: green channel worked well, blue channel did not work. SP2 flawless

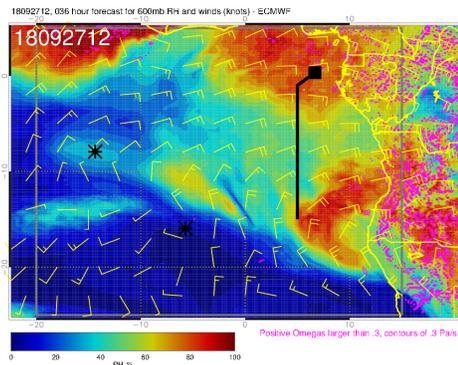
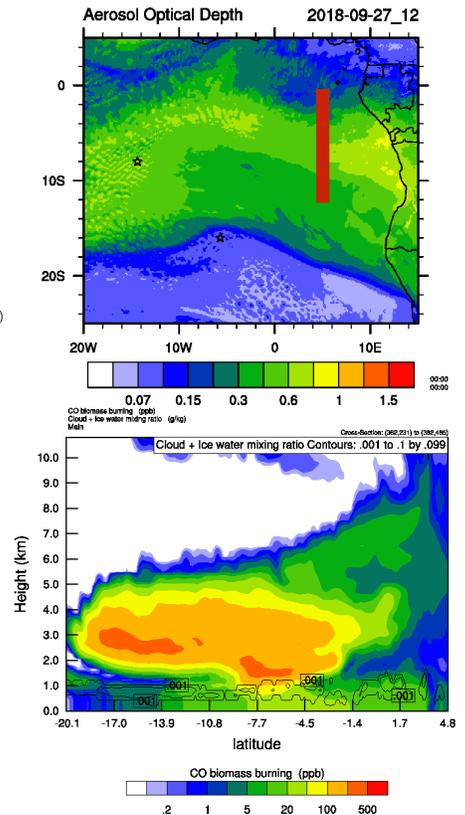
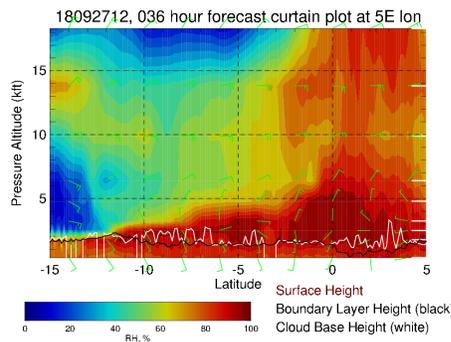
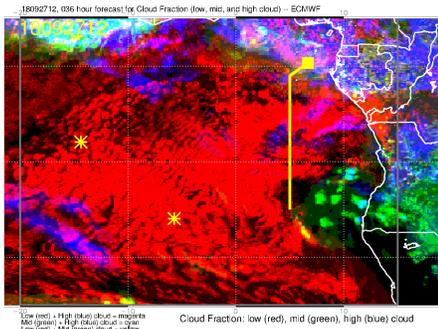
flight scientist: Paquita Zuidema  
ground scientist: Michael Diamond

flight plan and objective: routine flight plan to 12 S along 5 E.

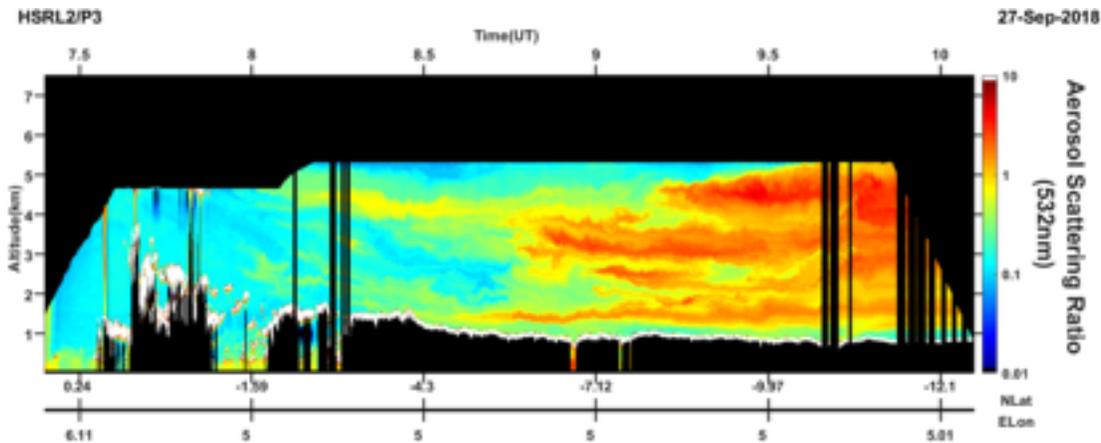
**Description of Legs**

- 1) High-altitude transit
- 2) Square spiral to near-surface at 12S
- 3) boundary layer module composed of 7 minute sub-cloud leg northbound; 3 sawtooths going southbound; 7 minute above-cloud leg 200 ft above cloud
- 4) ascend to aerosol layer
- 5) descent at 9S to 5 kft altitude, 7 minutes northbound
- 6) descent to surface, southbound leg 200 ft above surface for 7 minutes
- 7) dull sawtooths going north
- 8) 7 minute in-cloud level leg going south
- 9) ascent to 10 kft
- 10) descent to near-surface at ~5S, followed by sawtooths and above-cloud leg
- 11) ascent to x ft
- 12) ascent to high-altitude and transit home.

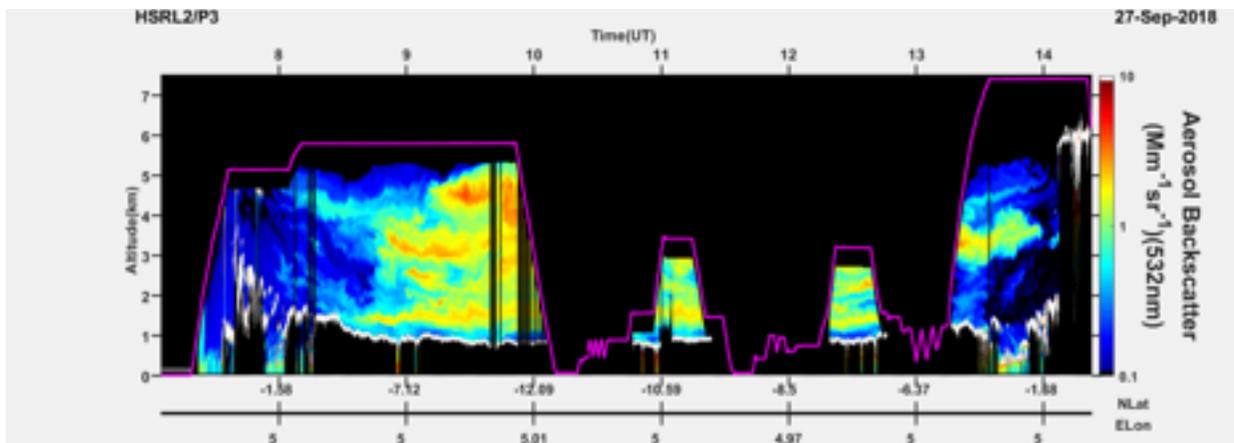
**A-Priori Forecast**



HSRL curtain along transit to 12S indicates main aerosol plume located further south than in WRF-AAM. higher aerosol layer completely missed in WRF-AAM



flight track superimposed on HSRL backscatter

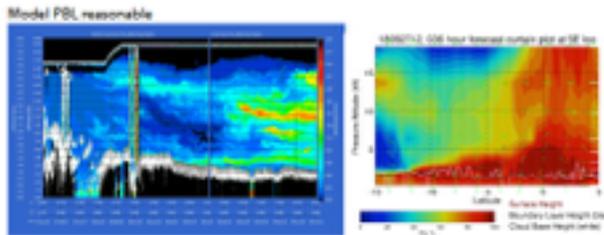


Runable

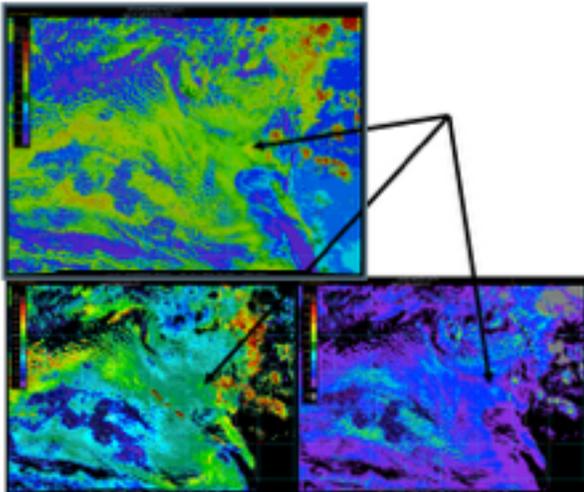
description	beginning time (UTC)	end time (UTC)	altitude	notes
takeoff	7:18			
ferry leg to 12S	7:47	9:49	16-18 kft	strong aerosol layering. some aerosol near cloud top
square spiral @ 12S	9:50	10:13		@ 12 S

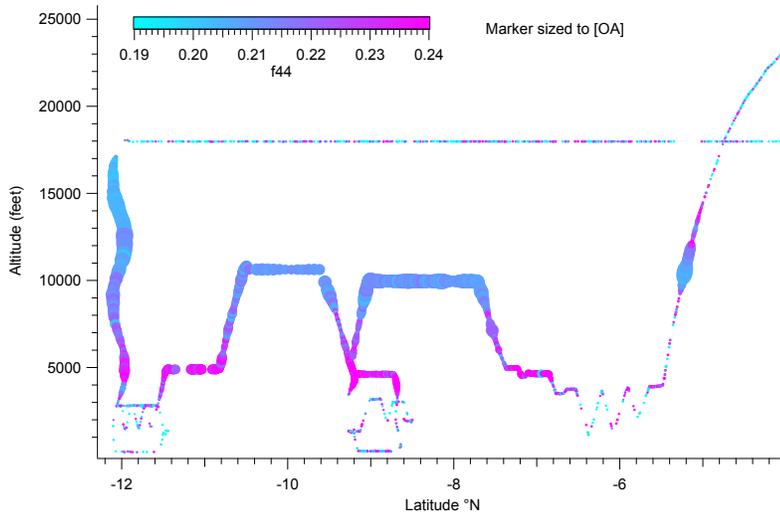
description	beginning time (UTC)	end time (UTC)	altitude	notes
near-surface northbound sawtooth southbound 200 ft above-cloud northbound	10:13 10:28 10:36	10:21 10:36 10:44	200 ft —	CO~70-80 ppb,rBC~25 ng/m3 Nd~80-150/cc gap
aerosol plume leg	10:46	10:56	1.5 km	rBC~2000 ng/m3. rBC 550-700/cc
aerosol plume leg	11:01	11:14	3.5 km	rBC 300-400/cc
radar leg	11:21	11:29	5 kft	rBC 350-550/cc
descent @ ~8.7 S southbound 200 ft leg dull sawtooth going N cloud level leg	11:44 11:49 12:03	11:49 12:03 12:14		no real gap lightly polluted MBL in situ Nd 85-150/cc SEVIRI Rd 60-120/cc
ascent to aerosol level leg	12:22	12:38	3.25 km	filter sampling. rBC 400-600/cc
aerosol plume leg	12:44	12:52	1.5 km	rBC 200-600/cc
above-cloud leg	12:53	12:58		rBC 45-75/cc
sawtooths, ~ 5.5S	12:58	13:15		lightly polluted
ascent to 18Kft, return transit	13:15	~14:00		
circuit around STP	14:00	14:20		sample local vs remote pollution
landing @ 14:20				

## Visual Notes

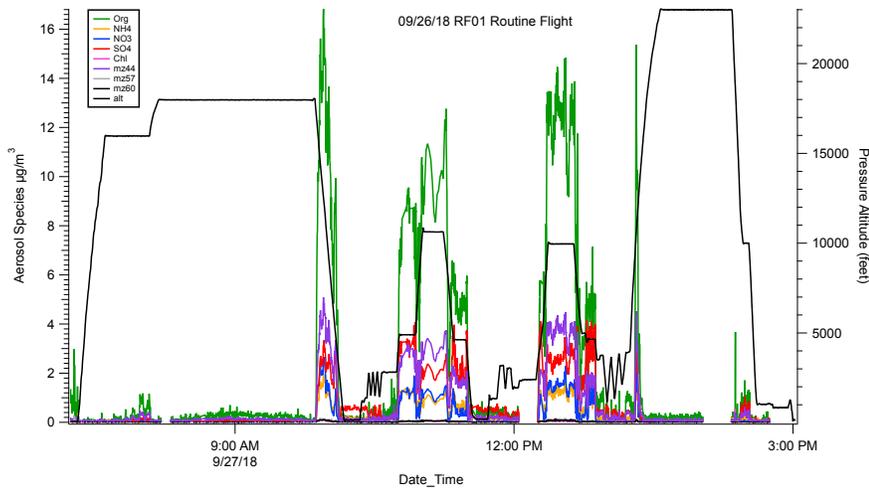


Interesting bright spot southeast of track — high Nd, high LWP

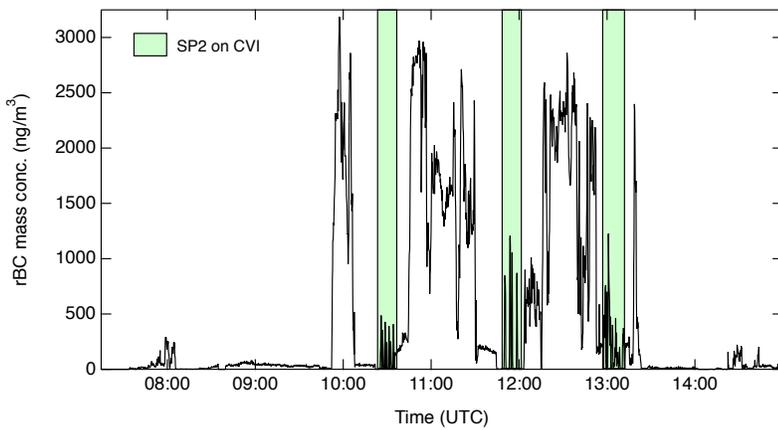




f44 marker corroborates younger smoke overlying older smoke structure seen in previous campaigns

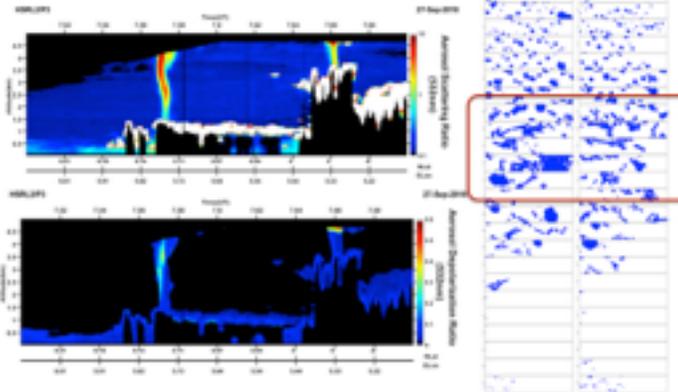


note increase in organic aerosol in sub-cloud layer moving north

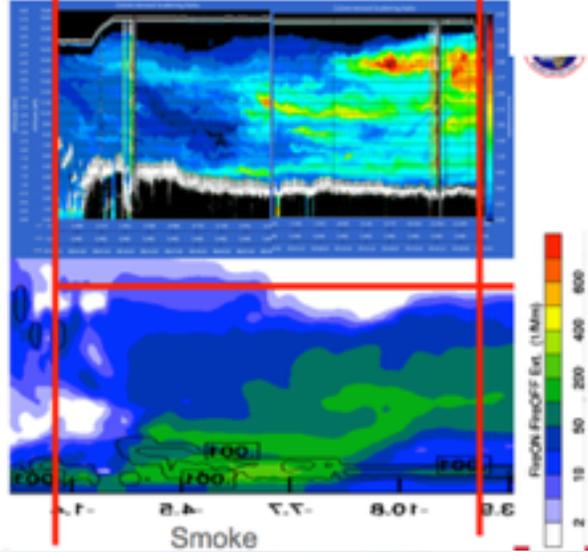


PTI SSA ~0.83-0.85 @ green wavelength

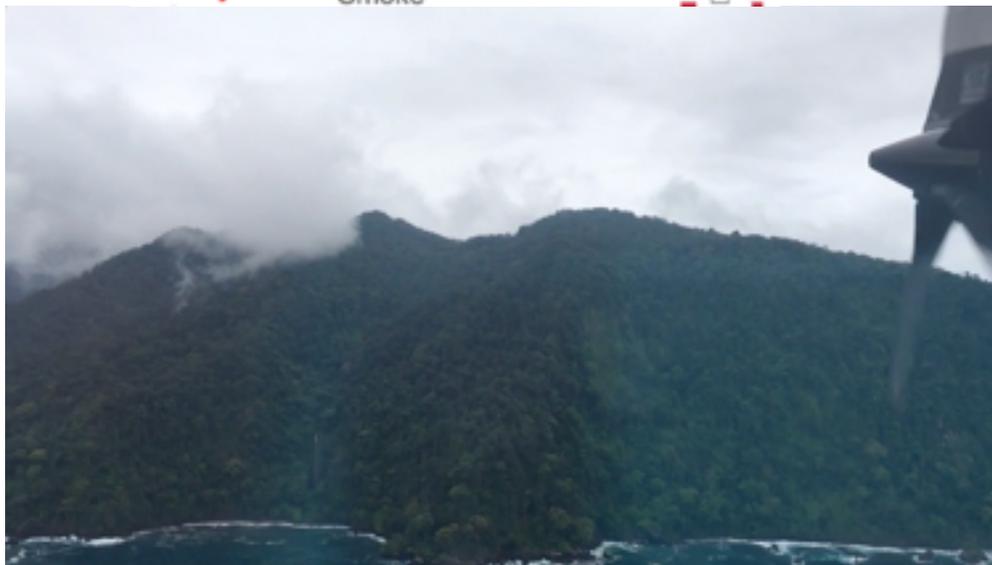
slightly <0C cloud producing columns  
& needle aggregates



• a later WRF-AAM aerosol forecast did better



but still missed the upper aerosol layer.  
high humidification likely contributed to its  
high extinction



blue circles indicate locations of MBL sampling

