

ORACLES P3 Flight Scientist Post-Flight Status

Date: __24 August 2017

Flight number: PRF08_Y17

Routine flight or target of opportunity? routine along 5E to 15S, included setting up trajectories for resampling on PRF09

Flight scientist: Paquita Zuidema

Assistant flight scientist: Michael Diamond

Ground Scientist: Rob Wood

Assistant Ground Scientist: Kristina Pistone

Take-off: 08:03 UTC

Landing: 17:12 UTC

Quick summary:

Representative ACAOD or ACAOD range for flight: 0.25 (15S) – 0.66 (8S); high cloud contamination to north

Do the models predict crossing a gradient in aerosol age?

Yes/No/Unclear YES. More of a vertical gradient at 5S than a horizontal gradient

Did the flight cross a gradient in macroscopic cloud properties, like cloud fraction?

Yes/No/Unclear YES. Solid deck at 15-10S, then small popcorn Cu to 5S, then Sc followed by mid-level cloud

Did the flight cross a gradient in aerosol loading?

Yes/No/Unclear YES

At any point during the flight, was there a clear separation between the smoke plume(s) and cloud tops? UNCLEAR

Yes/No/Unclear

How many of the following maneuvers took place?

Ramps __2__

Above cloud legs __2__

Square spirals __2__

Sawtooth legs __1__

MBL legs __3__

Plume legs __2__

Cloud legs __3__

Above plume legs __4__

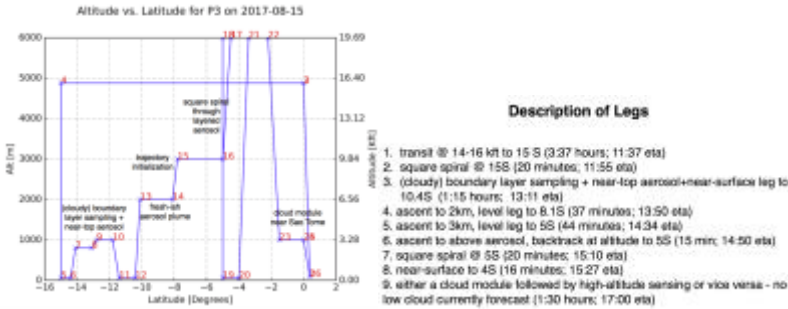
Instrument status:

Instrument	Comments
P3	Breaker tripped while plane still on runway, loss of power, affecting SSFR, HiGearAMS,

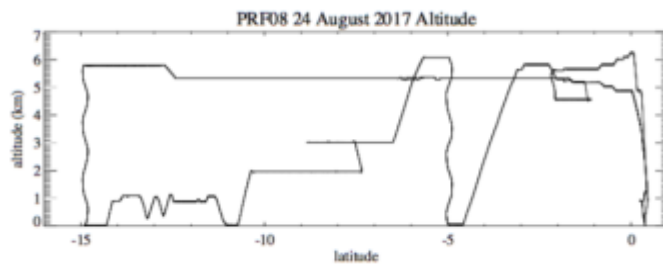
4STAR	nearIRspectrometer worked, all good
HiGEAR	HiGear inlet froze on mid-altitude level leg, some switched to heated CVI inlet others were shut off. Inlet worked again afterwards but need to be careful.
HiGEAR-AMS	AMS good. Affected by HiGear inlet freeze
HSRL-2	Something disturbing the near-field view, maybe on the window. Will check out during low-altitude near 15S.
RSP	All channels good
APR3	Minor problem w Kuband at beginning of flight
Cloud probes	UND CDP not working
CCN	Loss of power at beginning when breaker tripped, affected by HiGear inlet freeze, a question about performance of scanning mode
PDI	Will need more testing (contamination of the small size channel)
Vertical winds	good
WISPR/CVI	All good
COMA	good
SSFR	allgood
data	

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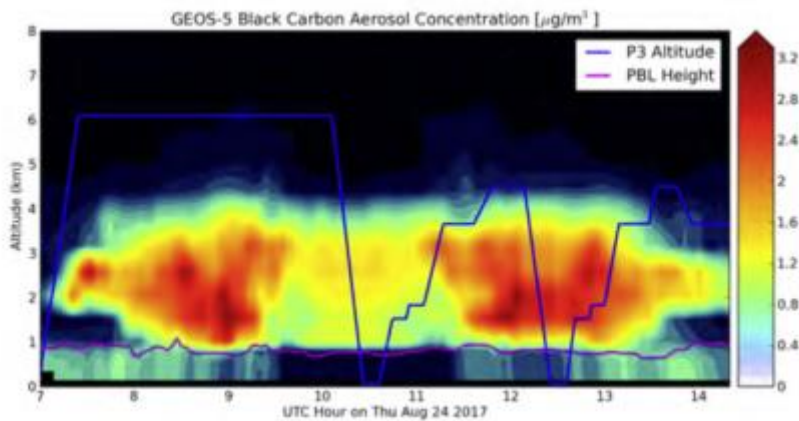
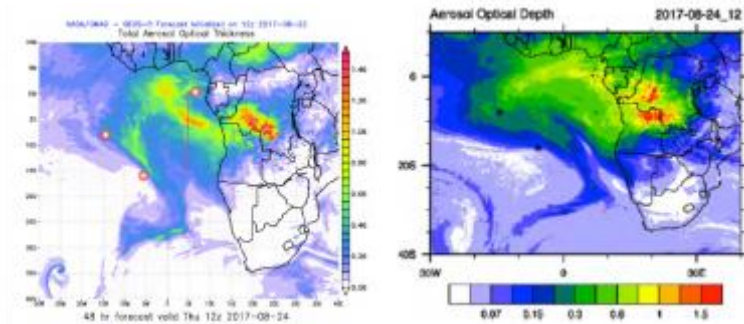
flight plan and objective: routine flight plan to 15S along 5E and back with some sampling of initial trajectory lines.



Flight Summary: the actual flight path

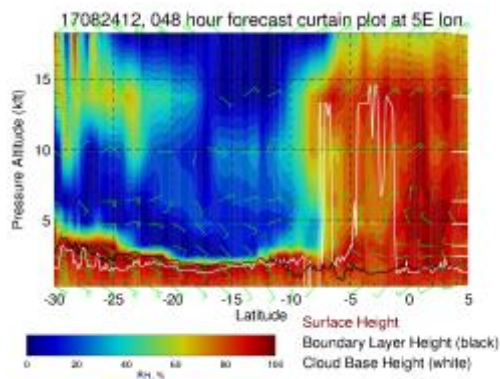
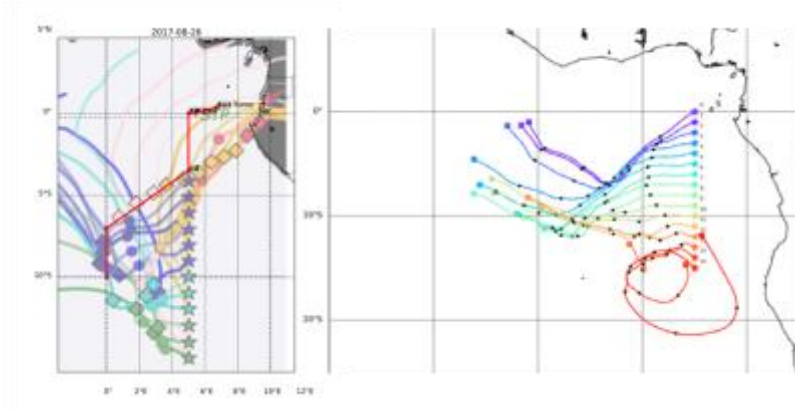


A-Priori Forecast:

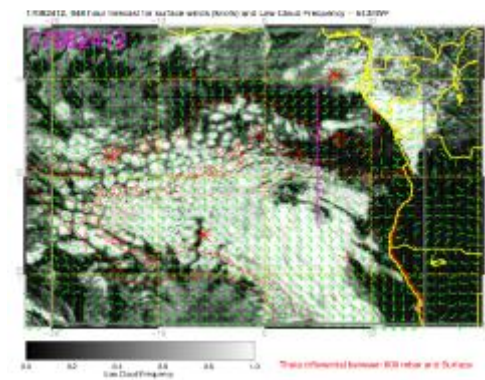


cross-sections at 5E from 8/23 suggested fresh aerosol is dominating the aerosol loading between 8-10S, with an interesting vertical gradient in

Sampling between 5-7S for 3km trajectories



Northerly push of moist air will encourage high clouds to 5-6S, mid-level clouds to 3-4S



Forecast for low clouds suggested little north of 10S, and possibly thin S of 10S

Flight Instrument status: Most major issue was that the HiGear inlet froze on mid-altitude level leg towards end near STP. Some instruments switched to the heated CVI inlet while others were shut off. Inlet worked again afterwards in warmer conditions.

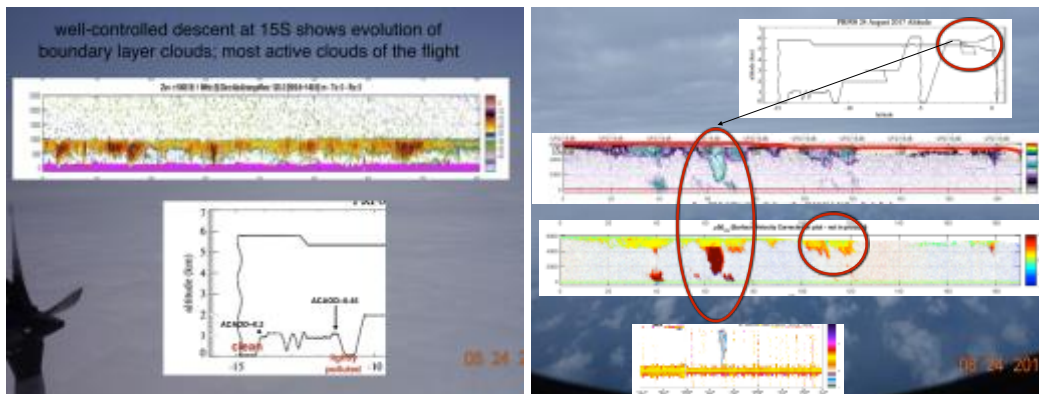
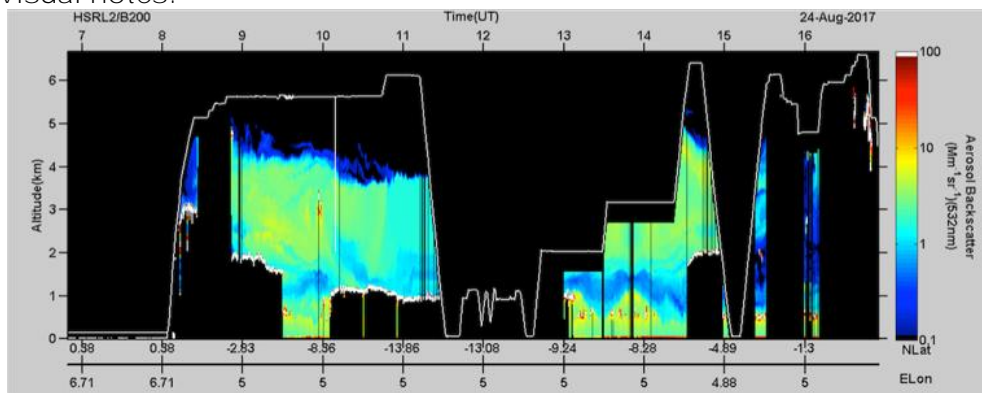
Flight Instrument/logistics notes: need to be careful about subjecting the aerosol and cloud probes to super-cooled water. Was able to do filter sampling within 12:43-13:27 aerosol plume.

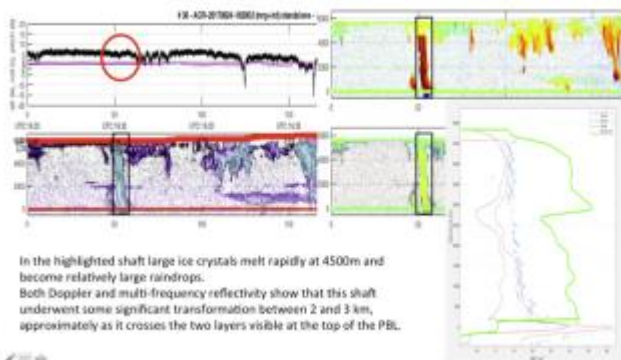
Run Table [UTC; approximate times okay, lack of detail okay. Just note major transitions, such as takeoff, time at point of furthest extent, time at beginning and end of major profiles with their detail relegated to the notes, such as spirals, level legs, straight profiling, and landing time]

description	beginning time	end time	altitude	notes
takeoff	0803UTC	X		Immediately in mid-level clouds
Ferry leg	08:30	11:11		Cloud with 2.4km tops, ~10dbz in parts, strongly sheared. 8:53: upper level cloud disappears ~2S. 1.7km pbl height @ 9utc, ~2.8S. heart of aerosol plume at 3.5km between 2S- aod of 0.04 above. Low level clouds are wavy, precipitating producing on south side. @4S. weakening by 5S. clearing, nice wave activity south of there. 9:58: cool cloud bank reaching 3km at 8.1S. embedded in aerosol. Cloud edge at 9S. went over the cloud wave at ~11S. going up to 19kft at 10:44 to help lidar resolve something directly beneath us. Turned out to be an artifact, possibly something on window. Aerosol below us at 14S just above cloud has high depol, low return, suggestive of dust.
Square spiral descent	11:12	11:30		
Near-surface leg 3minutes AC 5minutes AC+600 2sawtooths cloud level 10min 3 minutes AC MBL leg	11:32 11:45 11:56 12:10 12:24 12:28	11:41 11:56 12:09 12:22 12:27 12:39		Clean 0.28 ACAOD, cloud inactive, <300m ACAOD of 0.45 at end, Nd ~200-300/cc Lightly polluted, ~100counts/cc SP2
Ascent to 2km 2km level leg 3km level leg	12:37 12:43 13:33	12:43 13:27 14:24		45 minute long level legs to do fresh aerosol sampling 2km level leg aod=0.6, 10S-7.24 7.5S- popcorn cumuli below=clearing on EC forecast. 13 minutes of backtracking here. Went to 6.5S at 3km- unintentional. Northbound again at 13:54 utc
Ascent to 20km, transit north to 5S	14:23	14:44		Hsrl curtain
Square spiral descent to near-surface	14:42	15:05		

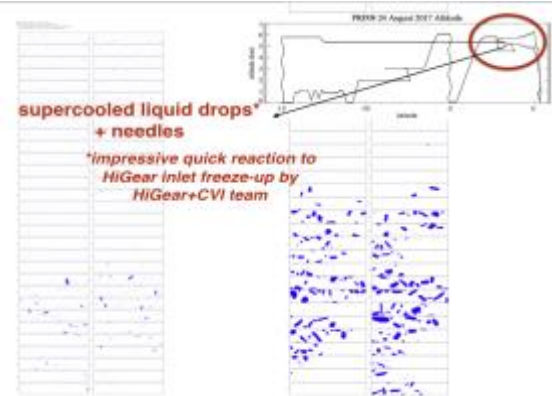
description	beginning time	end time	altitude	notes
MBL leg Ramp up	15:05 15:18	15:18 15:43		
Level leg	15:43	15:54	17kft	10-minute level leg incloud at 15:42. Simone: closed cells lasting 1 minute, a lot of shear. Single cloud. Clean. Occasional ice crystal in cloud probes, SDI inlet freezing.
Level leg	15:58	16:08	15kft	Mixed-phase cloud, instruments on SDI inlet turned off
Level leg	16:13	16:44		Aerosol plume
landing	17:11:53			raining

visual notes:



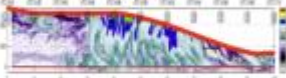


In the highlighted shaft large ice crystals melt rapidly at 4500m and become relatively large raindrops. Both Doppler and multi-frequency reflectivity show that this shaft underwent some significant transformation between 2 and 3 km, approximately as it crosses the two layers visible at the top of the PBL.

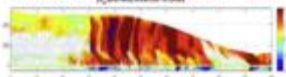


descent into Sao Tome

reflectivities 10-20 dbz



doppler velocities note wind shear



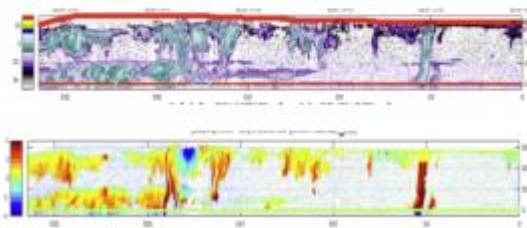
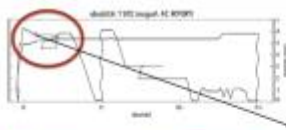
sizes > 1mm from differential reflectivities



supercooled water + needles + needle aggregates



significant wind shear



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