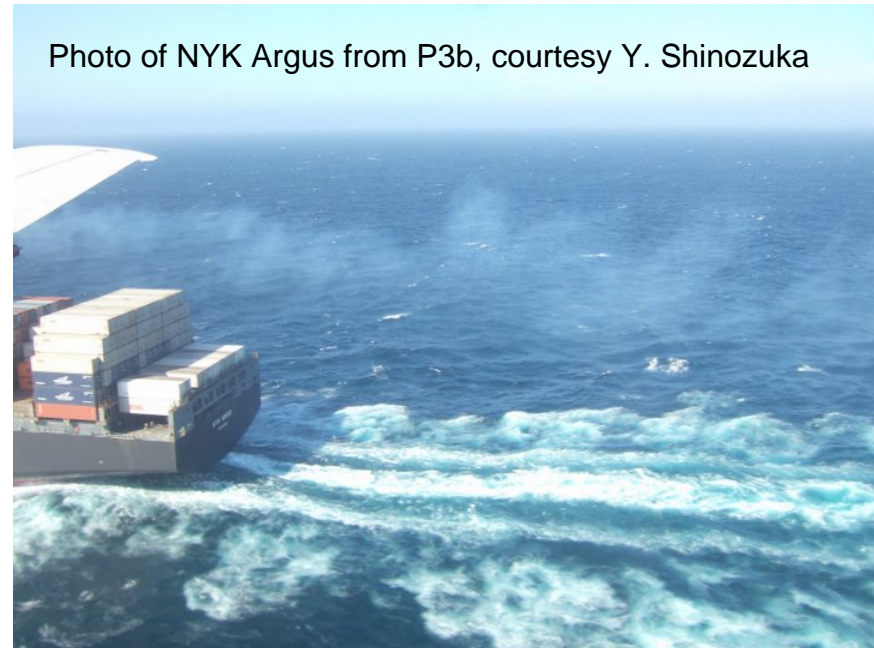
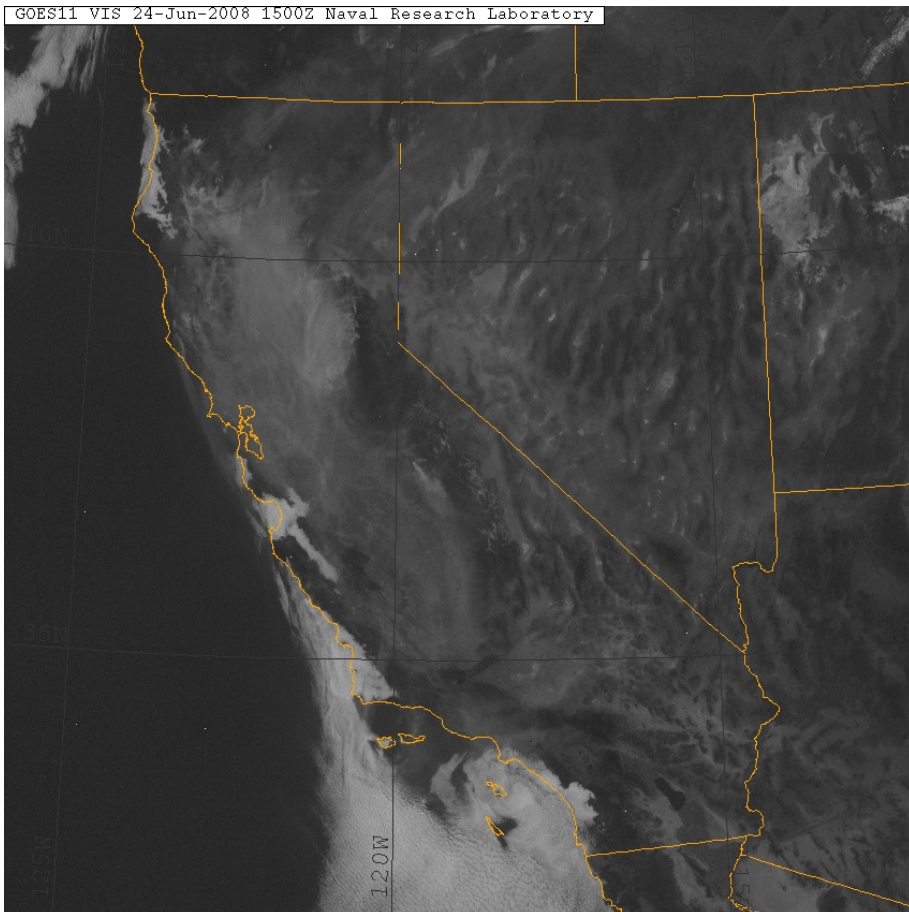
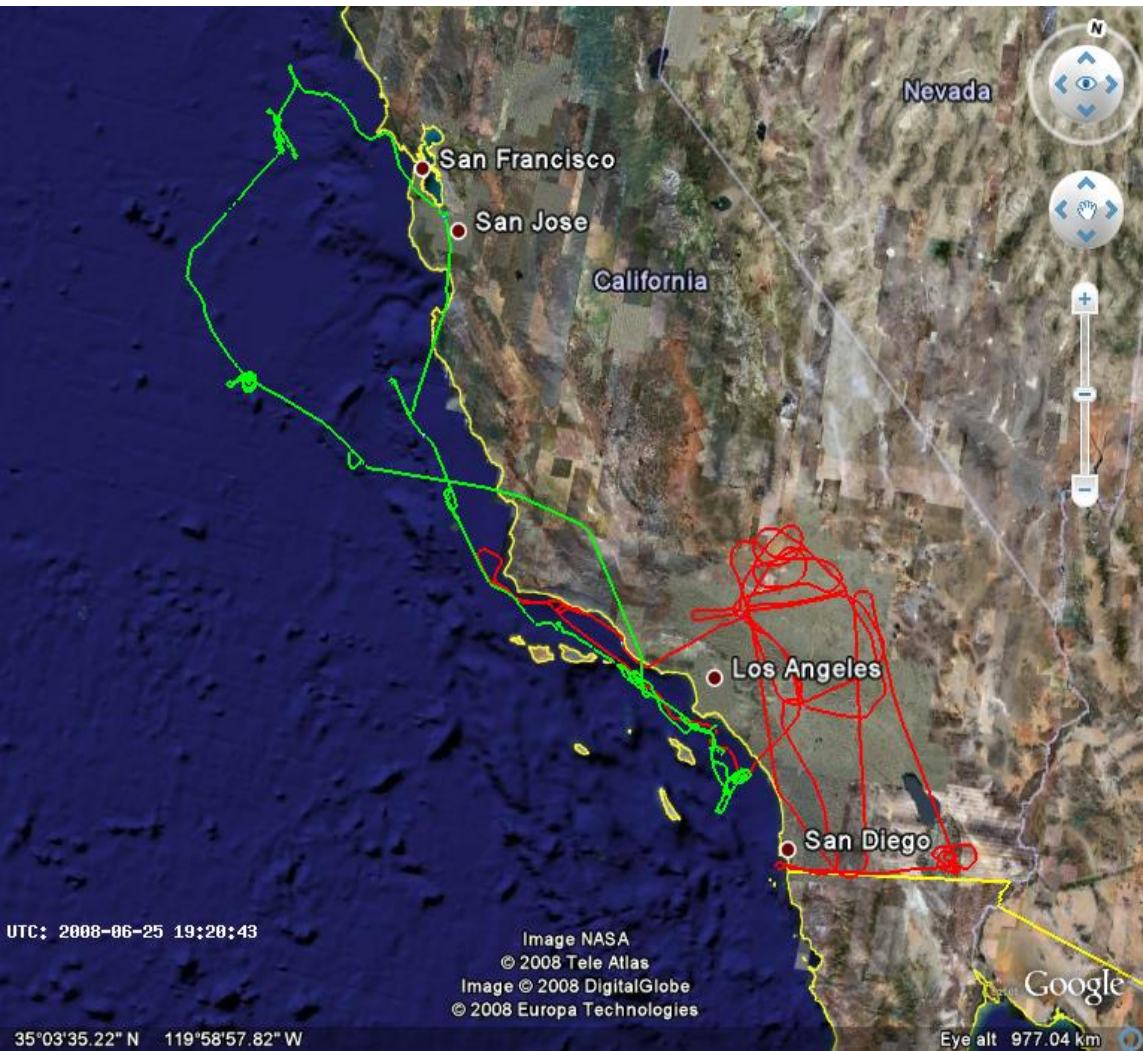


Flight Report
ARCTAS P-3B Data Flight 12, flown 24 Jun 2008 (CARB Science)
Submitted by Antony Clarke

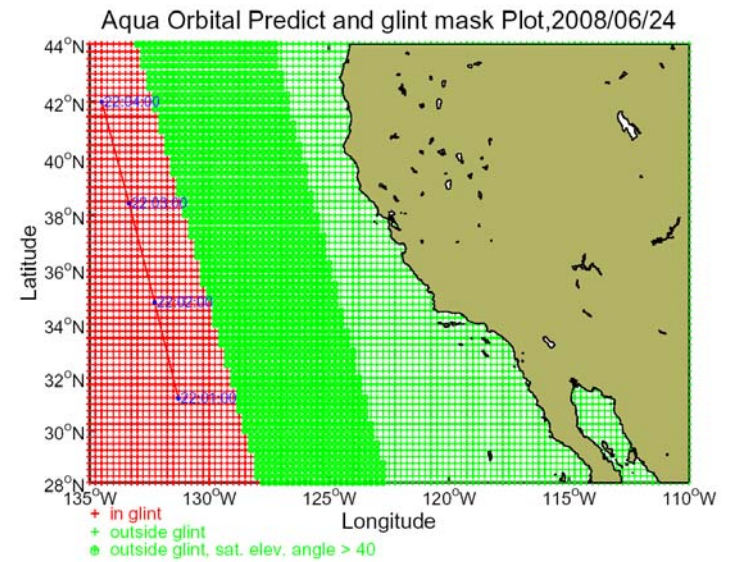
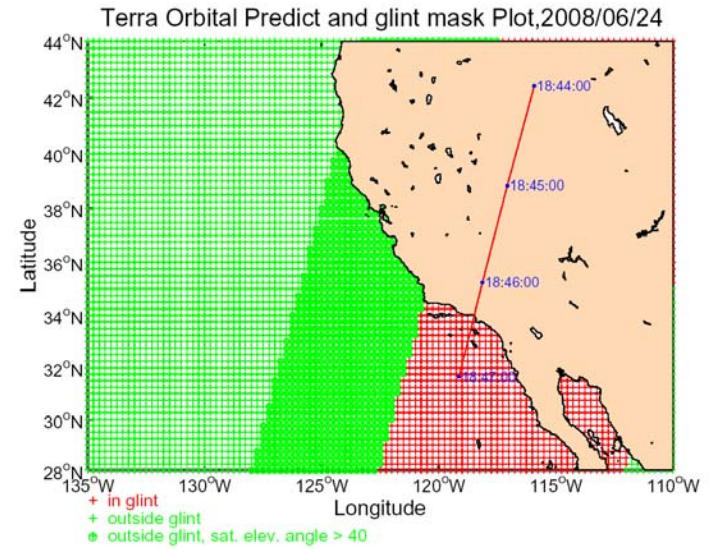
Objectives

- 1) **Characterize multiple ship plumes between San Francisco and Los Angeles**
- 2) **Ship plume – cloud interactions if possible**
- 3) **Spiral near Terra MODIS overpass (1147 PDT, 1847UT)**
- 4) **Spiral near Aqua MODIS overpass (1501PDT, 2201 UT,)**
- 5) **Aerosol gradients - coast to offshore**
- 6) **CAR circles, radiation legs**





Actual flight track P3b in green, DC-8 in red



~HHMM

- 1651 UT TAKEOFF (0951 PDT) – Head up Bay to Golden Gate and then out to Pt . Reyes
- ~1656 UT: Smoke below and evidence of layers above
- ~1659 Hazy, low visibility and cannot see surface or ships
- ~1700 800 ppb smoke plume
- ~1703 Can see surface but lot of smoke around
- ~1705 midvis AOD 0.45
- ~1712 alt. 500', 32 knot winds from NW, air cleaner , scattering 40Mm-1, CO 110ppb,
cargo ship ahead, 172m long (Lat 38 23.6'; lon 124 12.9')
- ~1734 ship has low and weak plume, Head S for larger ship 350m long, 42m wide cargo 37.85'N, -124.73W
- ~1748 ship plume, increase in CN but not much extinction or scattering
- ~1801 Try run up ship plume center and pass ship on the right, head for larger ship
- ~1809 Out of plume, Wind 45knots at surface, climb to 1,000', Wind at 346deg at 50knots!
- ~1810 Start 4 CAR circles, bank angle 30deg.
- ~1816 End 4 CAR circles, climb to 2000'
- ~1817 head to cargo ship Anastasia C
- ~1822 Drop to 1000' for 10 min run.
- ~1829 Drop to 200' for Anastasia C
- ~1833 In ship plume and holding; CN-30,000/cc; Absorption 4Mm-1, CO Up, Ozone down
- ~1940 10min run @ 2000'
- ~1845 see ship MEARSK KIMI, cargo, 300mlong, 42m wide
- ~1847 Drop to 200' toward ship, wind speed 30 knt.
- ~1850 hit large plume, Aero3X extinction 700Mm-1; CO 145 (background 110); Scattering 200Mm-1, Absorption 150Mm-1; CN 90,000,
CCN-12,000; lots of organics
- ~1858 spiral up to 7,000m after hitting plume for Terra overpass (18:47 UT)
AOD at top ~0.12
- ~1910 Some layer at 13,000 ft
- ~1930 in progress descent to above ship, Wind 40 knts
- ~1943 AOD increasing at 1000'
- ~1945 hit ship plume, XIN QIN HUANG VAO, 280m long
- ~1948 hit smaller plume BM MIMOSA
- ~1950 return to XIN QIN HUANG VAO, second pass
- ~2043 Calm Seas, much pollution haze, ship in view EVER LIBERTY 285m long, cargo
- ~2051 hit narrow plume, mostly below 200'
- ~2105 hit? top of plume of MARIGOLD at 200' – no visible plume – high CO
- ~2112 200', hit plume SANTA MONICA, 234 m long
- ~2113 200', try to hit plume ZIM MEDITERANEAN, 294m cargo, 33 25.7', 118 118 05.1'

~2118 200' hit plume ZIM MEDITERANEAN on retry
~2130 Start climb to 15,000' for Aqua AOD 0.48 surface, AOD 0.1 at 15,000'
~2157 hit pollution at 4,000' on descent lots of organic (fires?)
~2200 at 200', Aqua overpass 22:01
~2203 climb to 1000ft? cloud passage, PVM appears to be working.
~2204 hit plume FRISCO MIZAR tanker, 285m, 50m wide, 33 20.6' 118 03.4'
~2214 resample ZIM MEDITERANEAN plume
~2219 4 CAR circles over calm seas
~2237 200' Weak plume for ANDROMEDA LEADER cargo, 200m long, 33 48.6' 118 49.8'
~2246 200' plume BUM EVN tanker, 146m
~2254 up to 500'?, ship EVER LIBERTY, CO increases w/ organics, sulfate decrease, organics double, CCN increase
~2300 AOD 0.382
~2333 ship plume LU HE, cargo 280m, 34 54.7' 121 17.9' under broken thin stratus, try cloud study
~2338 cloud leg 1300'
~2345 drop to 800' and return under cloud, no plume evident
~2355 low small cumulus, thinning out
~2357 climb AOD 0.45 @ 500' AOD 0.32 at 2000'; CO increase; CCN decrease
~2404 NYK ARGUS, cargo, 300m, 35 49.2' 122 05.6'; Perfect plume visible in clean air.
Fly plume axis, all measurements elevated, UCN over 100,000 etc.
~2406 Turn ahead of ship and re-fly plume in reverse on opposite side to try and stay out of our exhaust. Good
~2413 Head for home under pilot control.
2441 TOUCHDOWN

Summary

Excellent flight with all objectives met in exactly 8 hours.

19 Ship (generally 200-300m length) plume crossings, ranging from almost undetectable to as much as 30ug/m³ sulfate

Terra satellite radiation - PM_{2.5} profile in "clean" air off Monterrey, preliminary AOD~0.17

Aqua satellite radiation - PM_{2.5} profile in heavy pollution and smoke off Los Angeles, preliminary AOD~0.62

4 CAR circles over ocean w/ 50knt winds

4 CAR circles over calm ocean

Data in fire plumes and pollution plumes

Some above and below stratus legs but ship plumes too low for plume cloud interactions

Post flight calibration of TECO ozone by CARB excellent, about 3ppb zero offset and about 1% off over range of cal points.

Instrument Reports

AATS – 14 Worked well but heavy salt build up early in flight will require careful analysis, corrections

AERO 3X Worked well, but experienced mirror degradation later in flight.

BBR Worked great, no issues

CAR Worked great, lost one channel near end of flight

CCN Worked well, undergoing data quality check.

COBALT Worked great, no issues, Max recorded CO of 2,500ppb on this flight

HI GEAR Great flight, no issues

AMS Great flight, no issues

PDS Worked great, no issues

Reveal Xchat intermitted and lost for DC-8 coordination, some broken DIAL transmissions

SSFR Worked well

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Flight Report

Aircraft :	NASA P-3B
Operating Site(s) From / To :	KNUQ/KNUQ
Flight Date :	June 24, 2008
Flight Number / Data Flight # :	584/CARB Science flight #12
Time out:	1646 (Z)
Time in:	0017 (Z)
Flight Time :	8.0
Flt Request # / PI:	8P301/ Phil Russell
Purpose of Flight :	Data [X] Ferry [] Functional Check [] Other []
Sensor Payload :	ARCTAS (CARB flight)
Comments :	Aircraft is in an up status and ready for the next flight. Today's flight was flown for the California Air Resource Board with great success. The Terra Satellite was under-flown off the coast of San Francisco and an Aqua under-flight was obtained of the coast of Los Angeles. An optical

	<p>depth profile was accomplished along with flux radiance. City, organic and ship pollution were studied for atmospheric interaction. 19 ship plumes were investigated during the flight. All the instruments are up and ready for the next flight. The REVEAL instrument provided intermittent x-chat which is being worked on. DC-8 LIDAR curtains were obtained but had missing packets. The AIS system proved to be invaluable in obtaining ship locations, size, type and name of craft. John Barrick was instrumental in directing the aircraft for ship interception. The next flight is scheduled for 26 June and it will be the transit flight to CFB Cold Lake in combination with a data flight.</p>
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SUBMITTED BY: Dave Easmunt 24 June 2008

Flight Hours for ARCTAS Campaign

Flight	Date	Aircraft Flight #	Data Flight#	Duration (hr)	Remaining Hours*
<i>Total Allocated</i>					90.3
Reveal Test /Training Flight	6/13/2008	583	PCF 1	2.0	88.3
Transit To NUQ	6/19/2008	582	Trans	7.7**	No charge
PCF/Data	6/22/08	584	#11	3.5	84.8
CARB/Data	6/24/08	585	#12	8.0	76.8

*Allotted flight hours include the following:
ARCTAS – 75 hours
CARB – 8 hours
Hours carried over from Spring ARCTAS – 7.3

** transit flight billed as a maintenance flight