

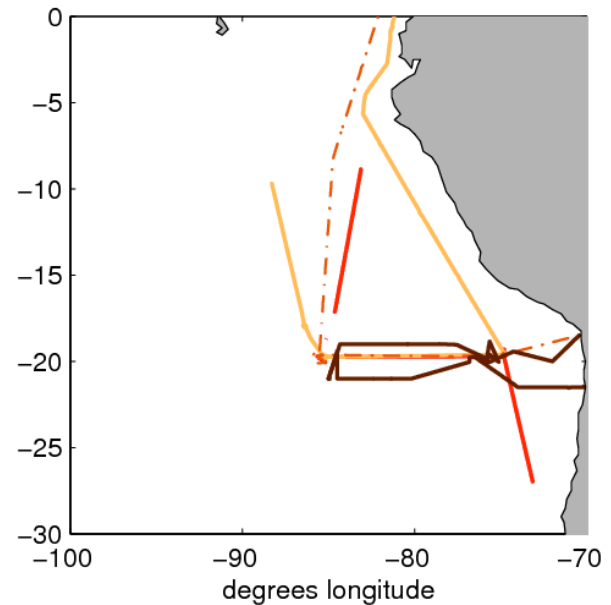
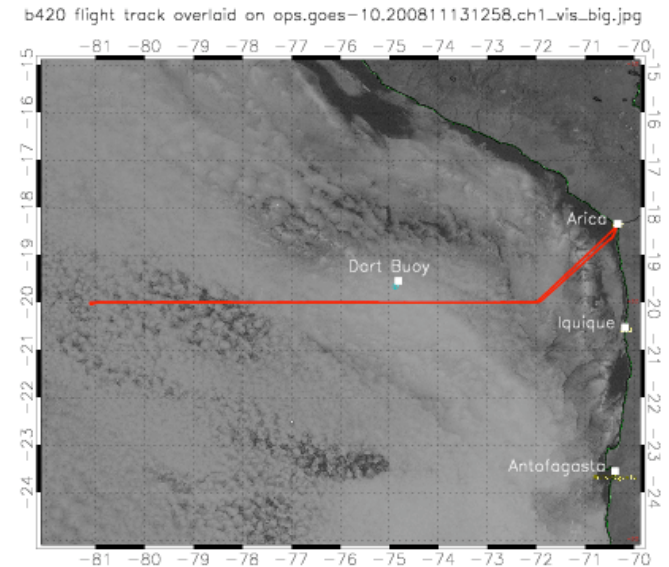


**20° S Cross-section Mission
Analysis – Summary/Synthesis**

Seattle Meeting – 14th July 2009

Data Summary

- 6 BAe-146 flights – to 83 W
- 4 suitable Dornier flights – to 76 W
- 10 suitable C-130 flights – to 88 W
- G-1 Flights – to 78 W
- RHB – Continuous in situ data
- Soundings and buoy data
- Continuous (geostationary) and overpassing satellite data
- Historical cruise data



2006 Oct 20	—	Oct 22
2007 Oct 26	—	Oct 24
2008 Oct 27	- - -	Oct 30
2008 Nov 20	—	Nov 11 Nov 28

Right: c/o Simon deSzoeker

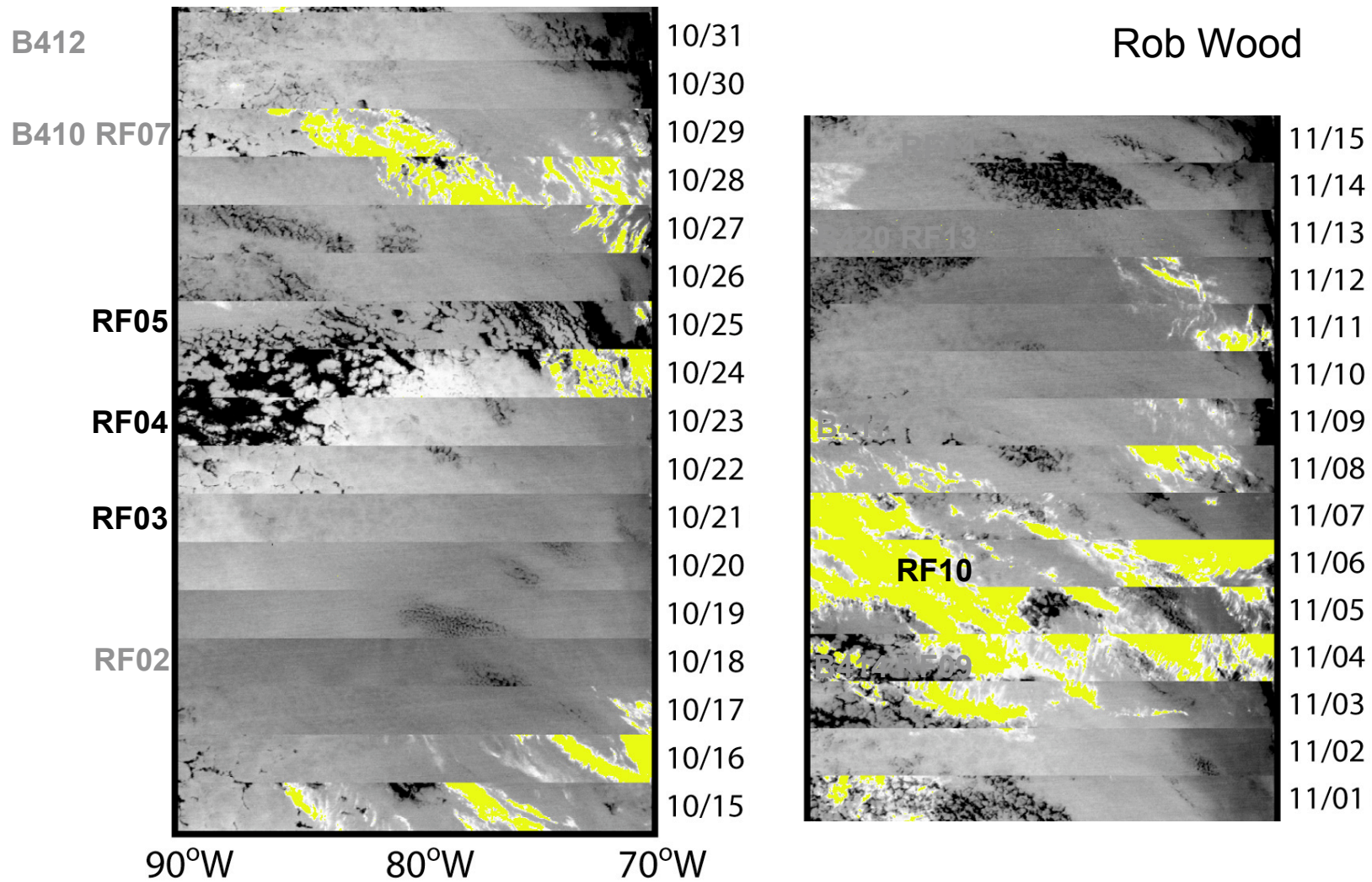
20 South Cross-Section Missions - All Platforms

Mission	Date	Aircraft		LONGITUDE West (on 20S)												Mission#	Times for 20S data		
				85	84	83	82	81	80	79	78	77	76	75	74			73	72
#1	Oct 18th	C-130	OUT															RF02	13:04:09-16:09:10
		C-130	RET	No return 20S component												RF02	N/A		
#2	Oct 21st	C-130	OUT															RF03	06:03:00-10:03:15
		C-130	RET															RF03	10:03:15-14:08:00
#3	Oct 23rd	C-130	OUT															RF04	05:53:00-09:50:00
		C-130	RET															RF04	09:50:00-14:20:00
#4	Oct 25th	C-130	OUT	R														RF05	06:32:24-10:58:00
		C-130	RET															RF05	11:00:20-15:25:00
#5	Oct 29th	BAe-146	OUT															B410	
		BAe-146	RET															B410	
#6	Oct 31st	C-130	OUT															RF07	N/A
		BAe-146	OUT															B412	
		C-130	RET															RF07	12:16:00-14:58:00
		BAe-146	RET															B412	
#7	Nov 4th	C-130	OUT															RF09	N/A
		BAe-146	OUT															B414	
		Do-228	OUT															VA07	
		C-130	RET															RF09	12:24:50-15:19:00
		BAe-146	RET															B414	
		Do-228	RET															VA07	
#8	Nov 6th	C-130	OUT															RF10	06:10:14-10:09:00
		C-130	RET															RF10	10:09:00-14:19:00

Time Key	Time [local]	Time [UTC]
Black	3-4	6-7
Dark Grey	5-6	8-9
Medium Grey	7-8	10-11
Light Grey	9-10	12-13
Very Light Grey	11-12	14-15
White	13-14	16-17
White	15-16	18-19

c/o Chris Bretherton/ Rob Wood

20S IR strip charts (0845 UTC = early morning)

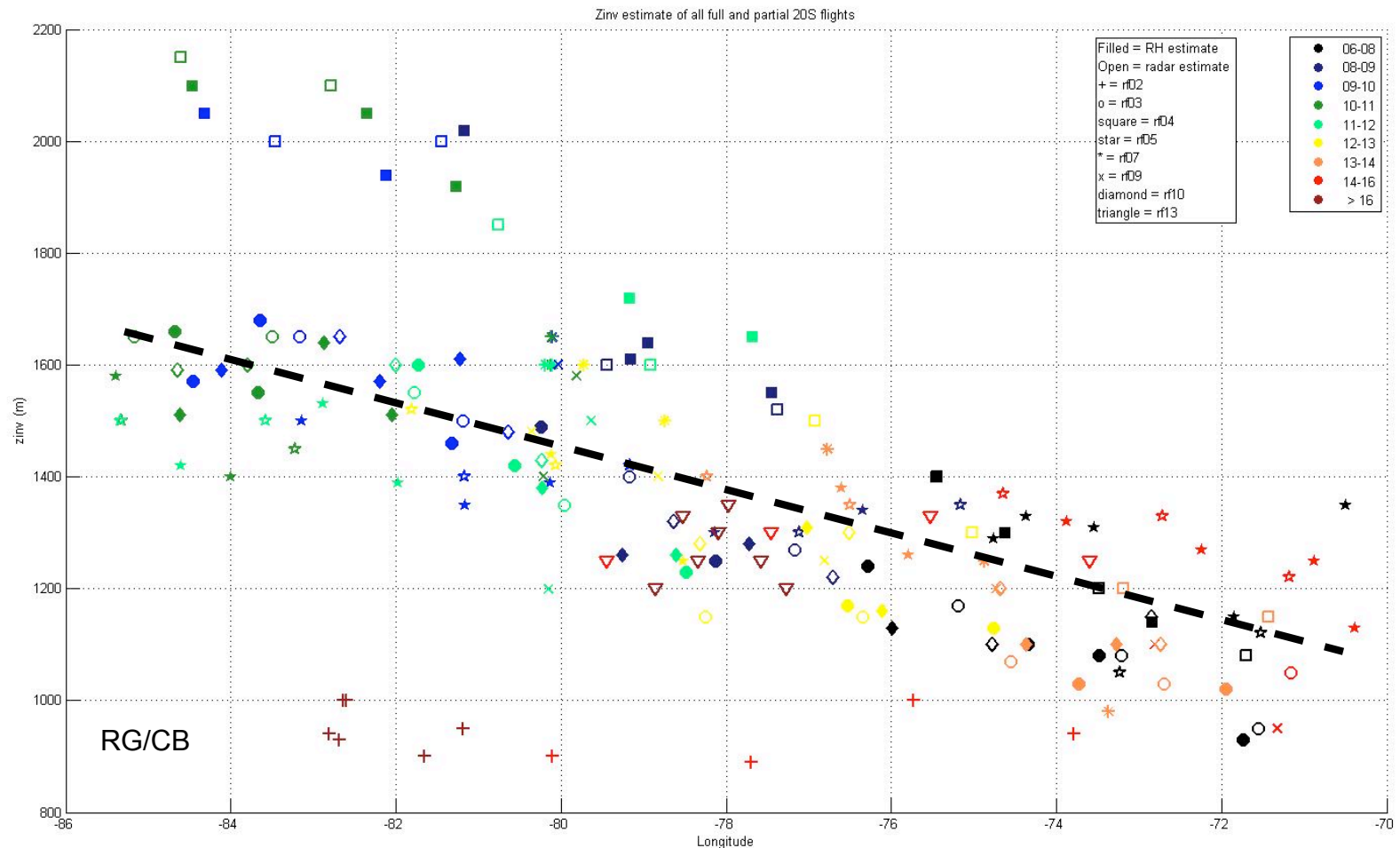


The 20S missions covered a representative range of cloud conditions

Inversion height

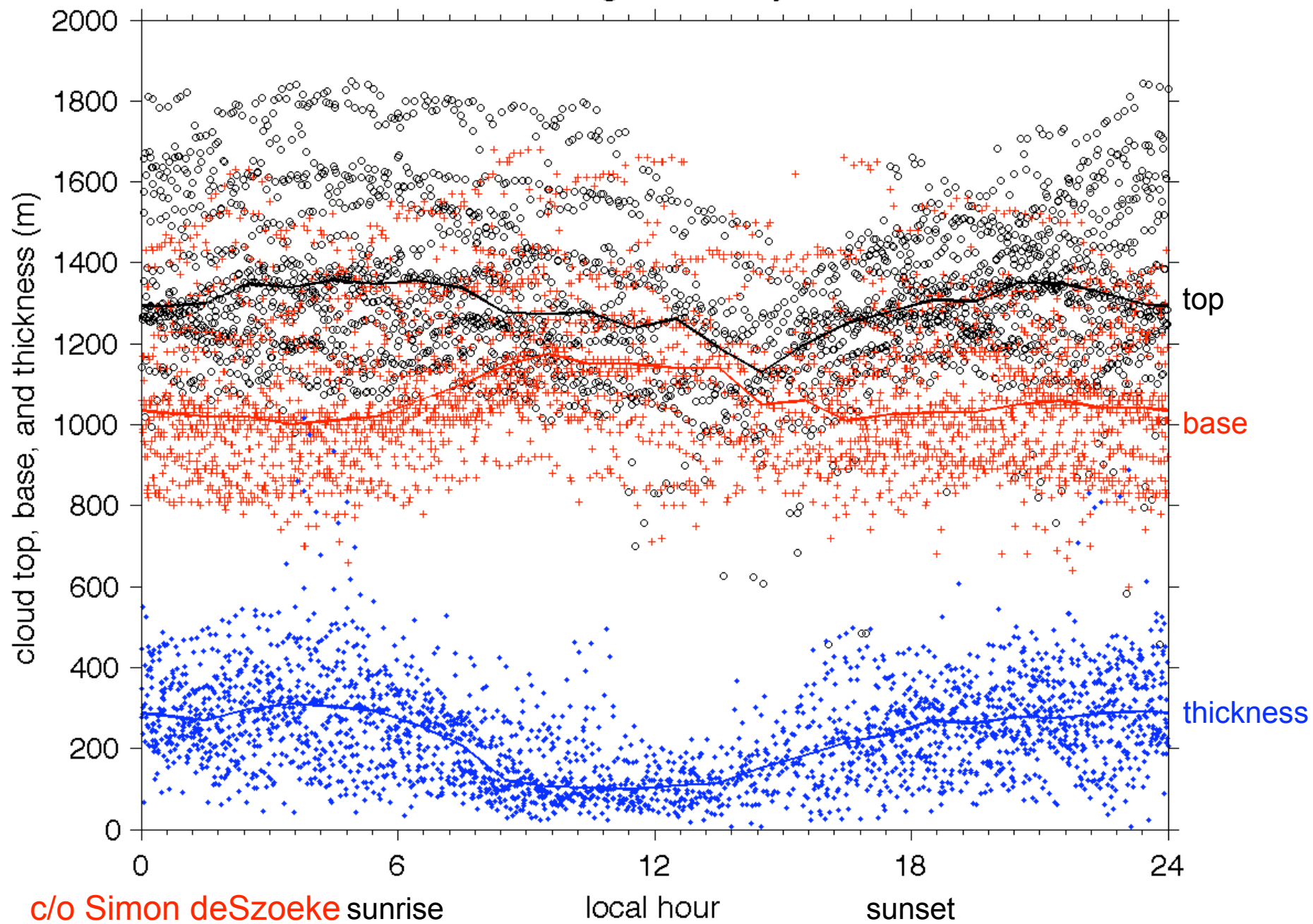
~1000 m near coast

~1600 m at 85W, except RF02 (900 m), RF04 (2100 m)

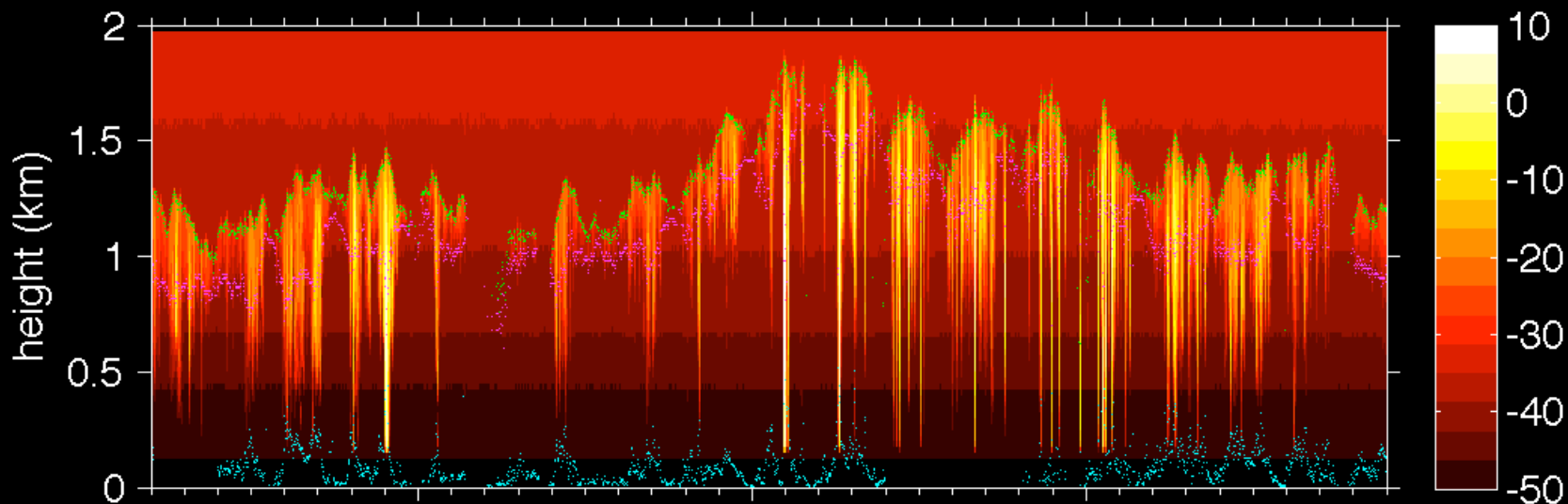


Chris Bretherton

cloud height diurnal cycle



W-band mean reflectivity (dBZ)



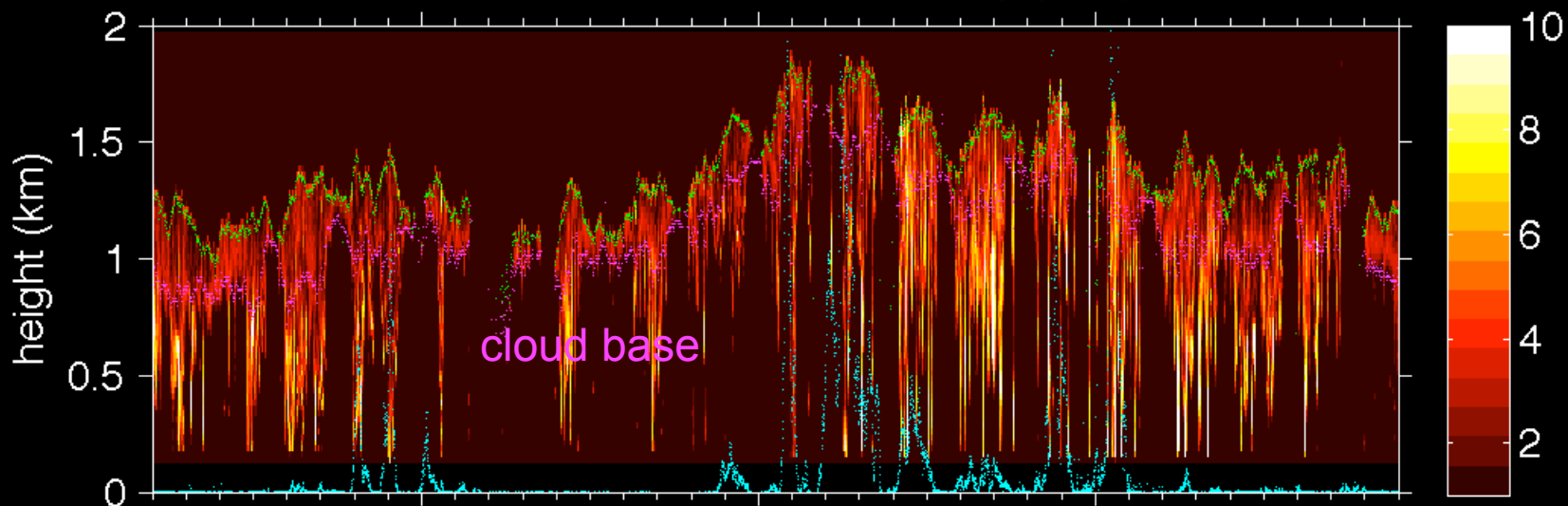
liquid water path
(kg m^{-2})

320

325

330

Standard deviation of reflectivity (dBZ)



C-band rain proxy
(1000 counts > 10 dBZ)

320

325

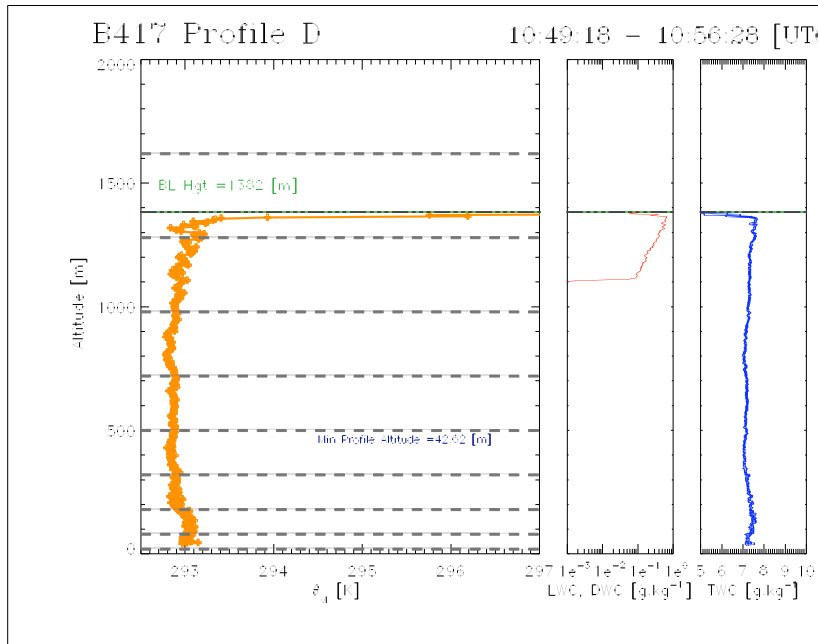
330

cloud base

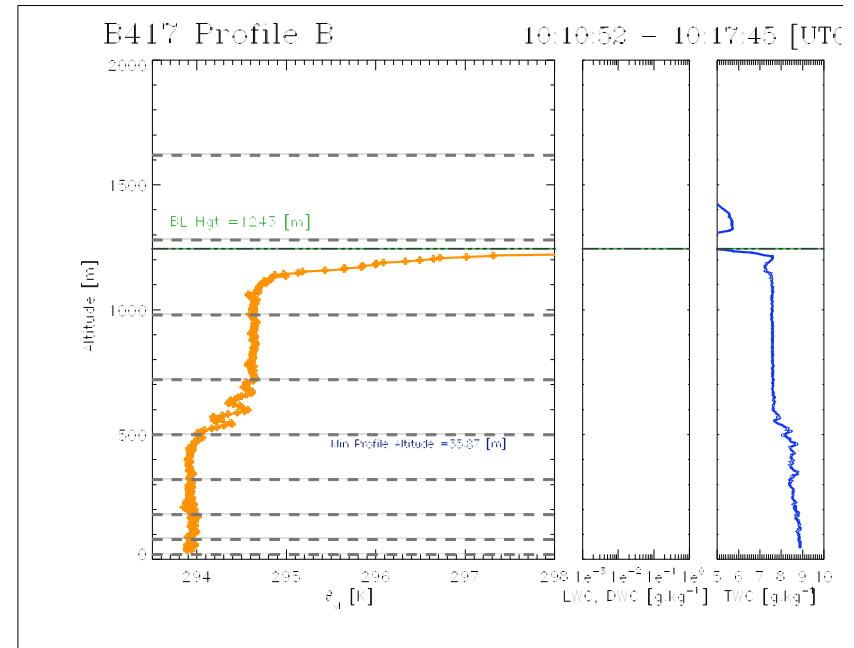
year day 2008

c/o Simon deSzoeker

Liquid water virtual temperature as a proxy for decoupled MBL

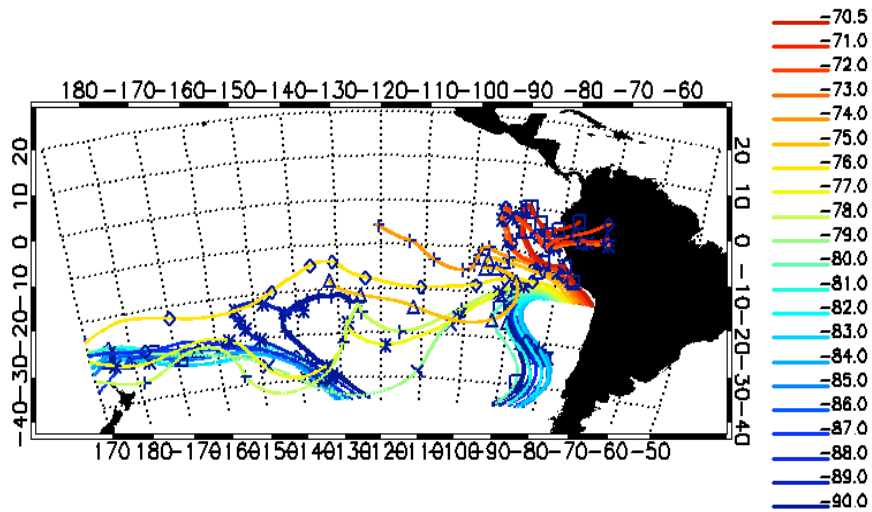


73.0°
Range=0.48°
Well Mixed
Cloud



71.0°
Range=0.31°
Decoupled
Cloud Free

10-day Back Trajectories, 20081024, 00UTC



Free troposphere

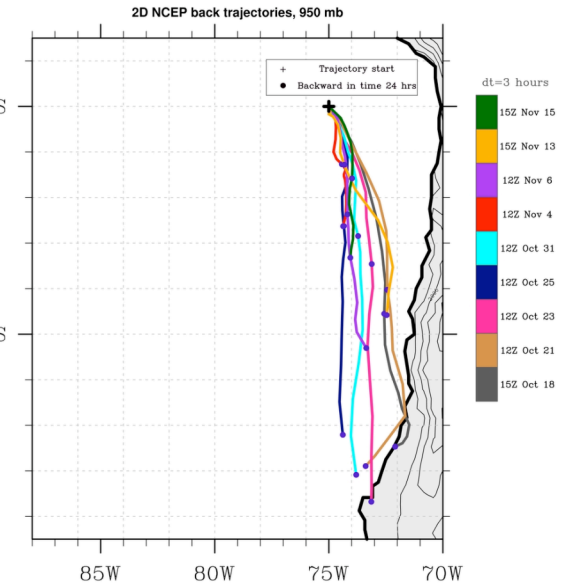
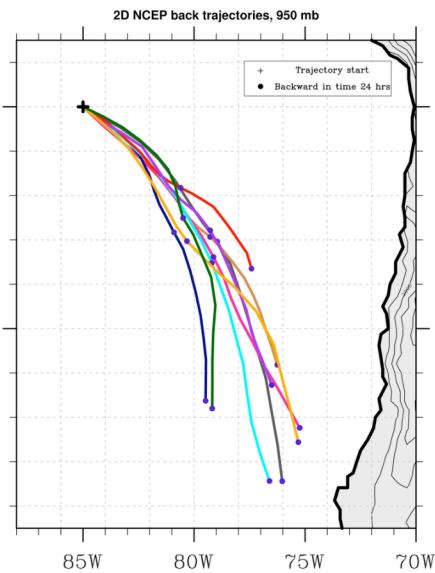
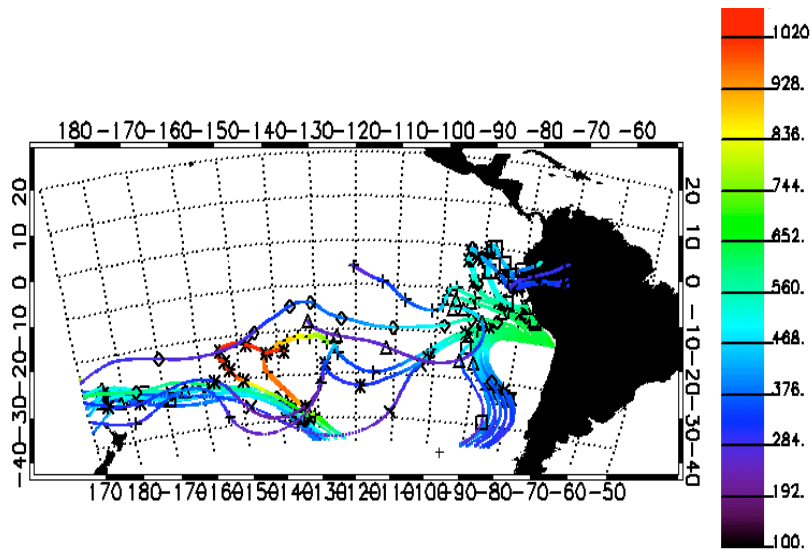
Gradient in sources going out from the coast along 20 S

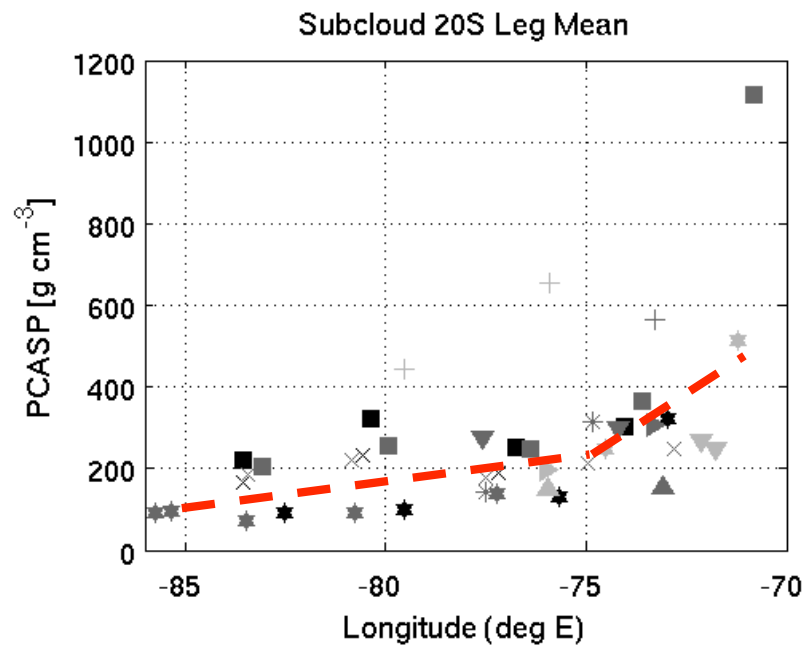
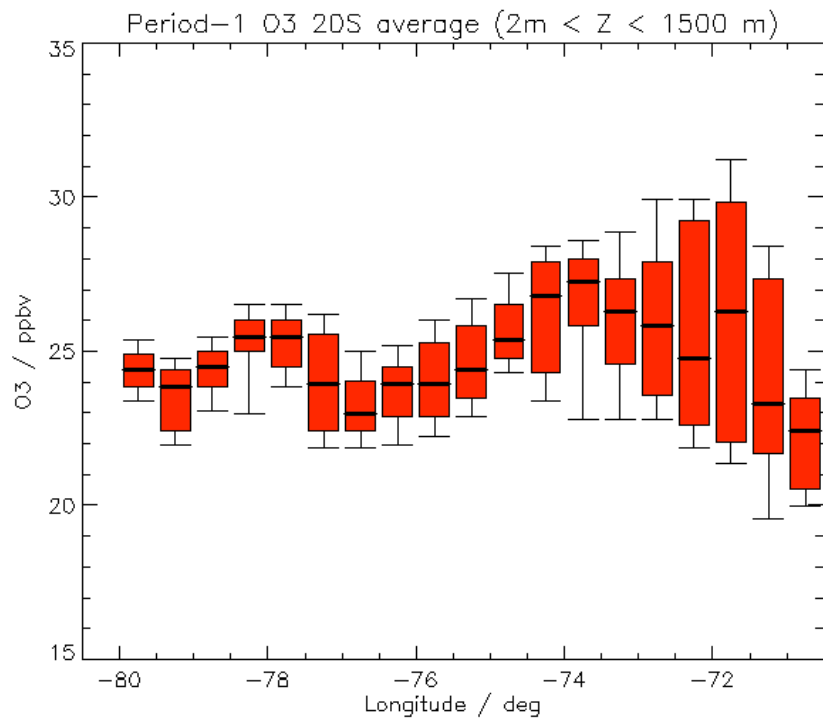
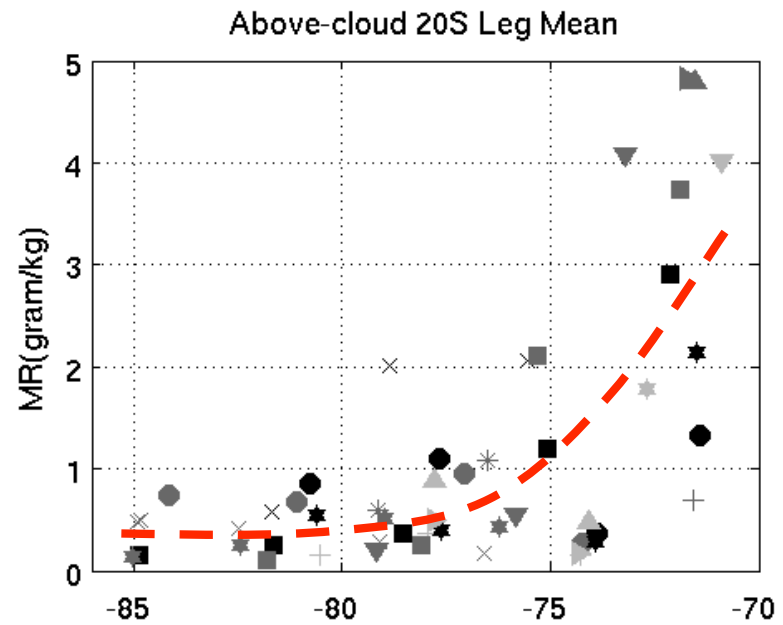
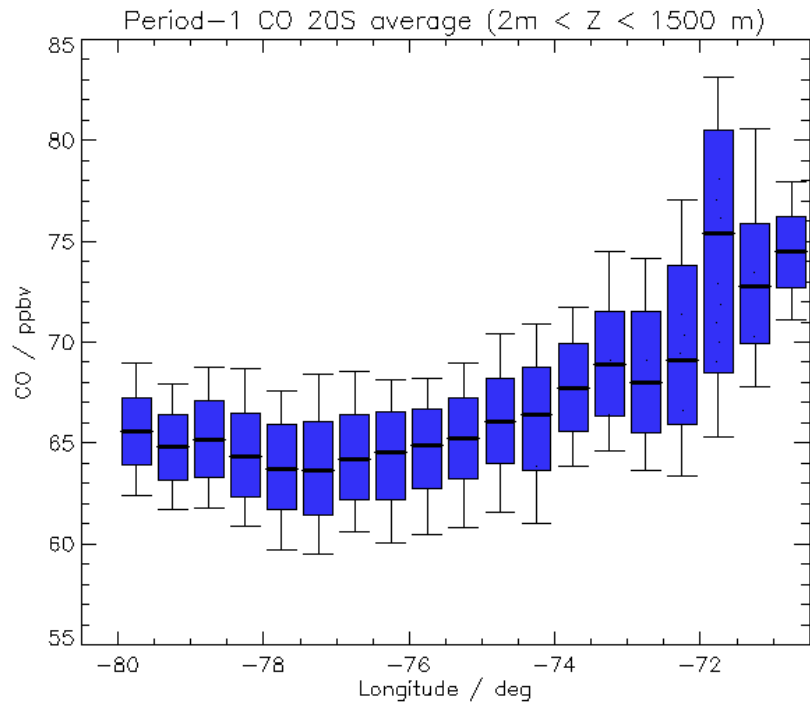
Near Coast – Continental PBL from Brazil

Remote maritime – Long-range transport in STJ

Boundary Layer

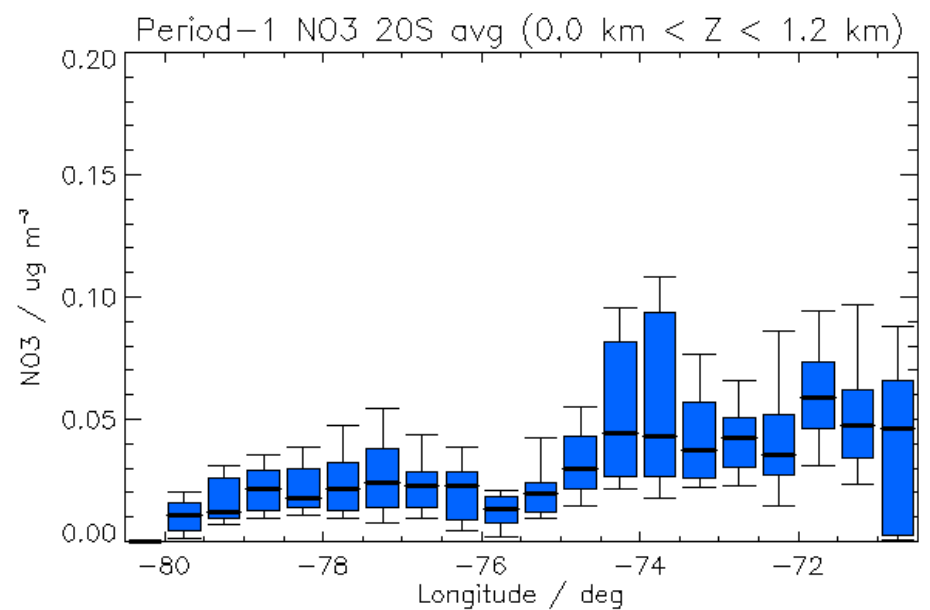
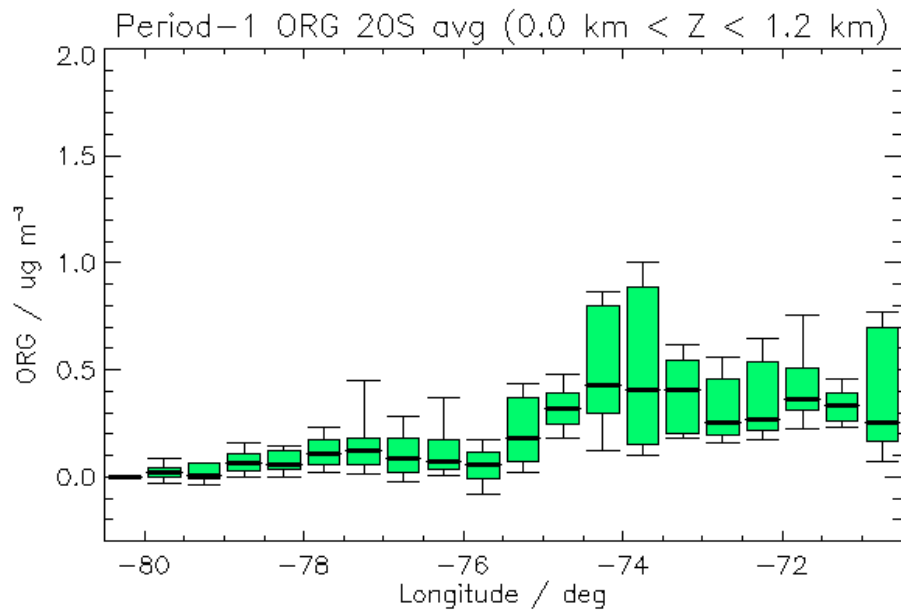
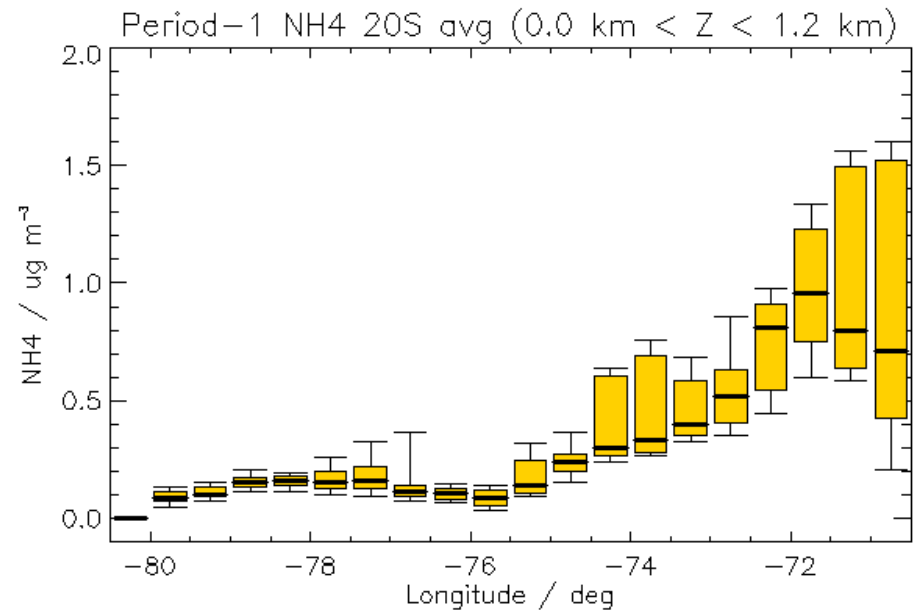
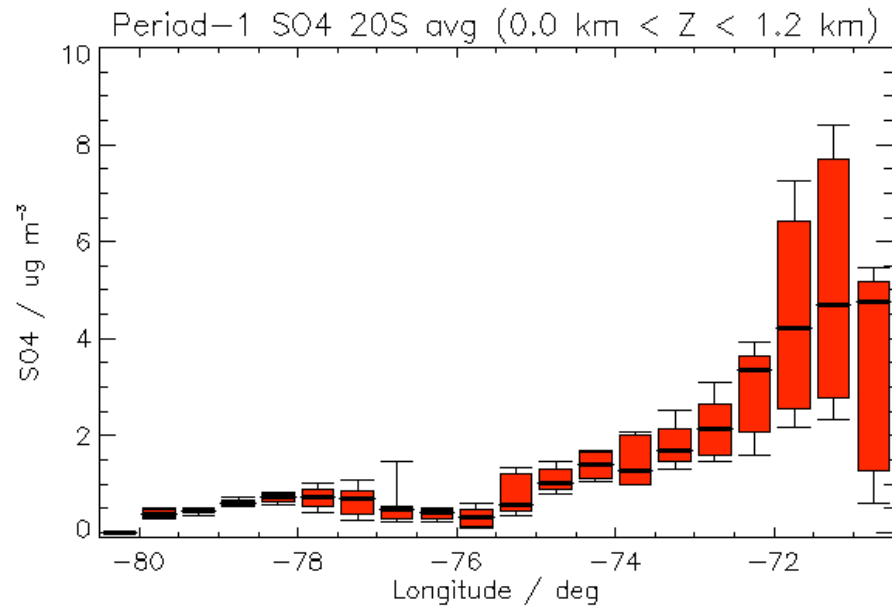
SE and Southerly Origin



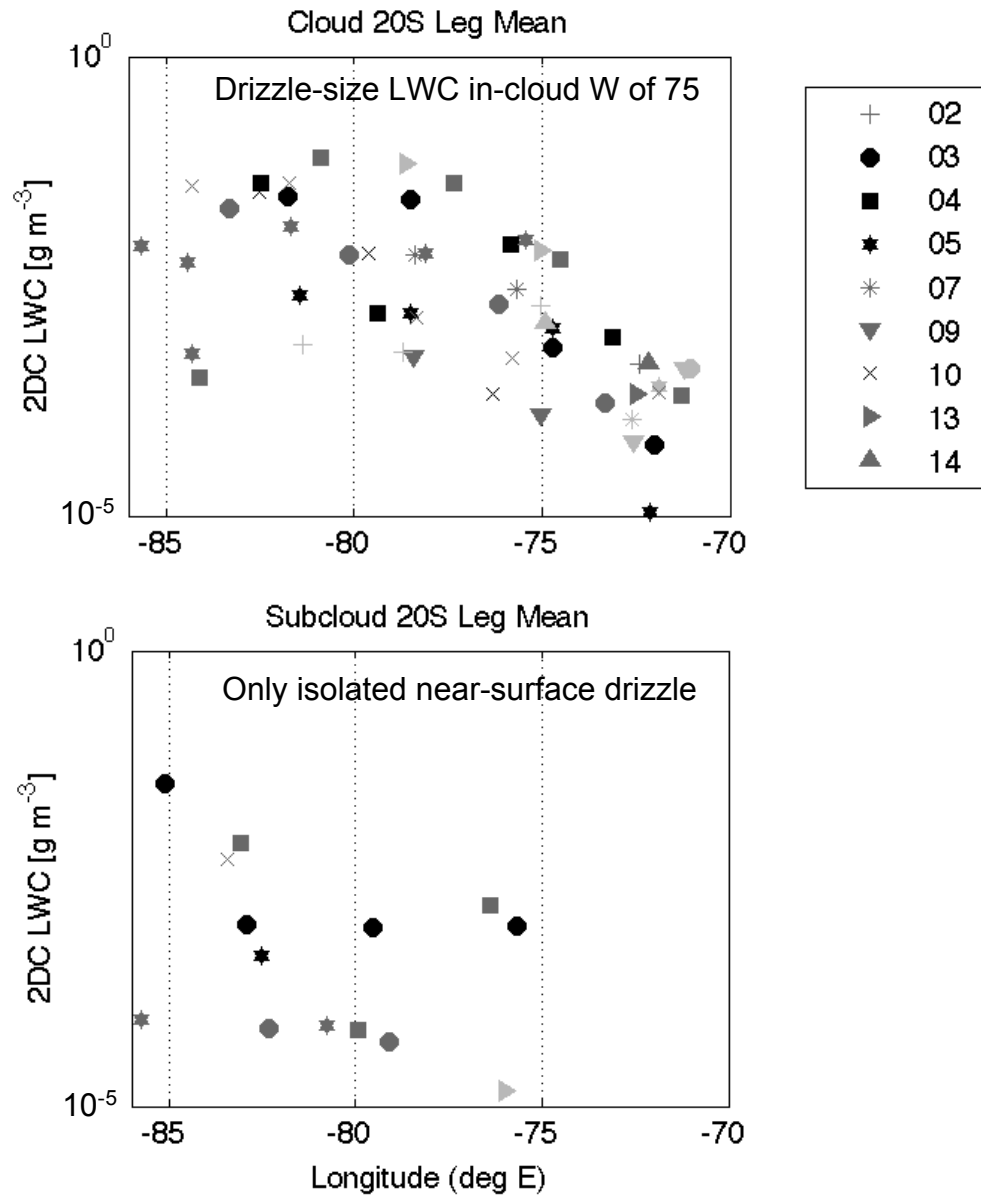
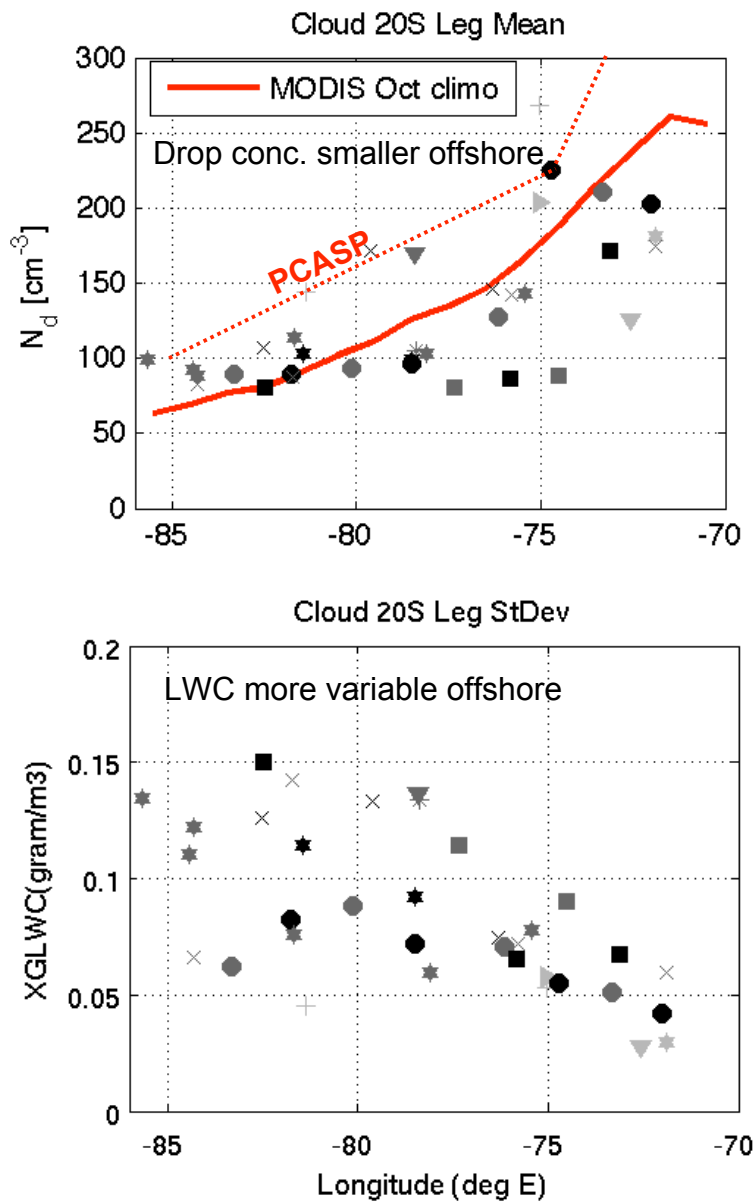


Above – Chris Bretherton

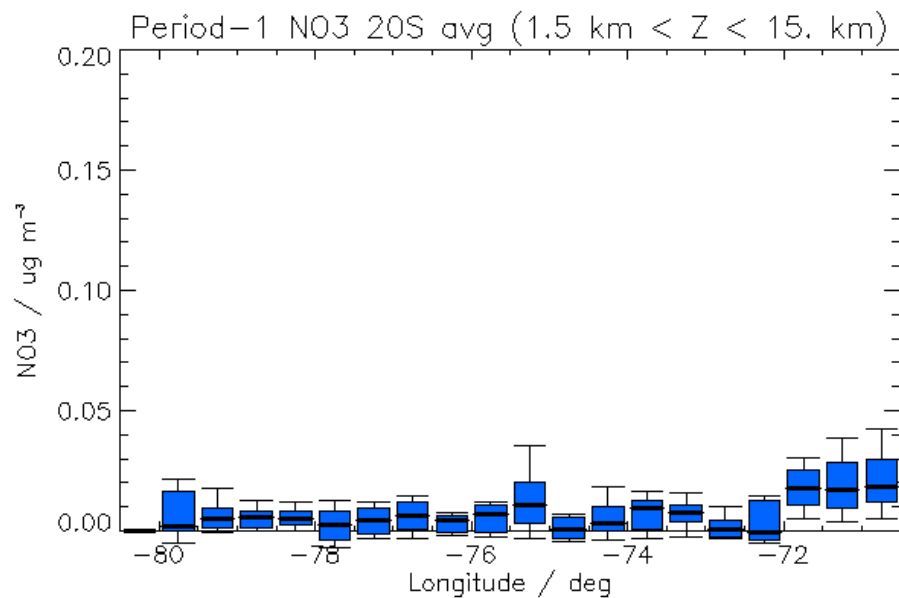
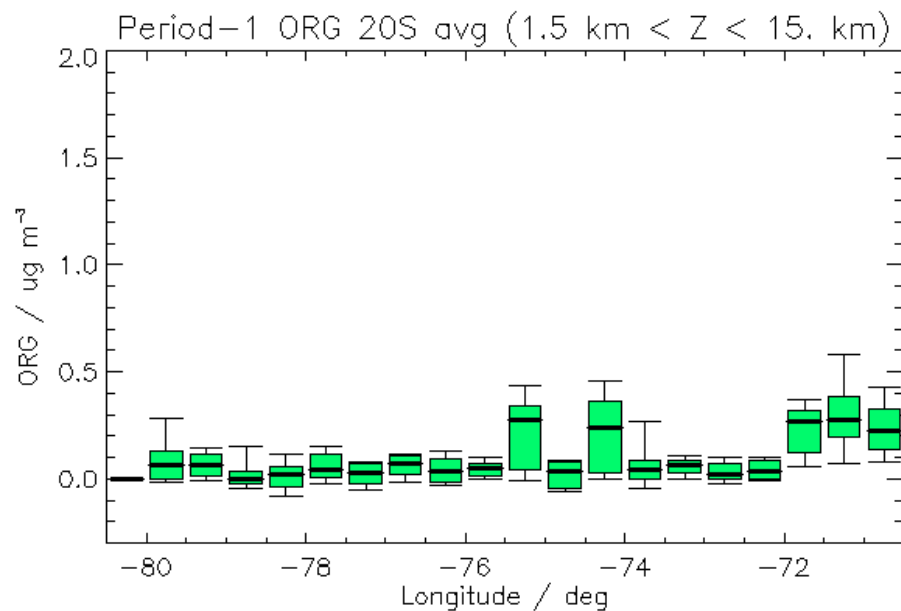
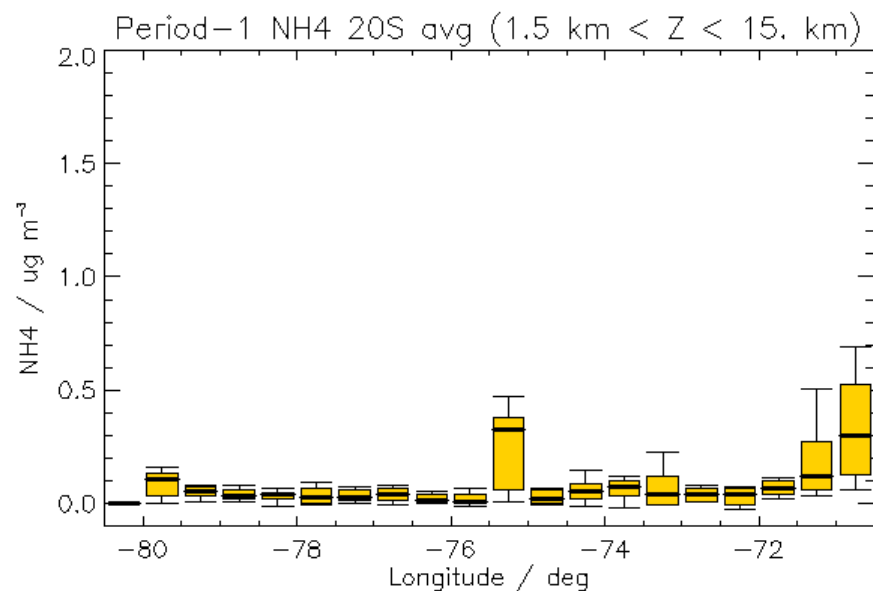
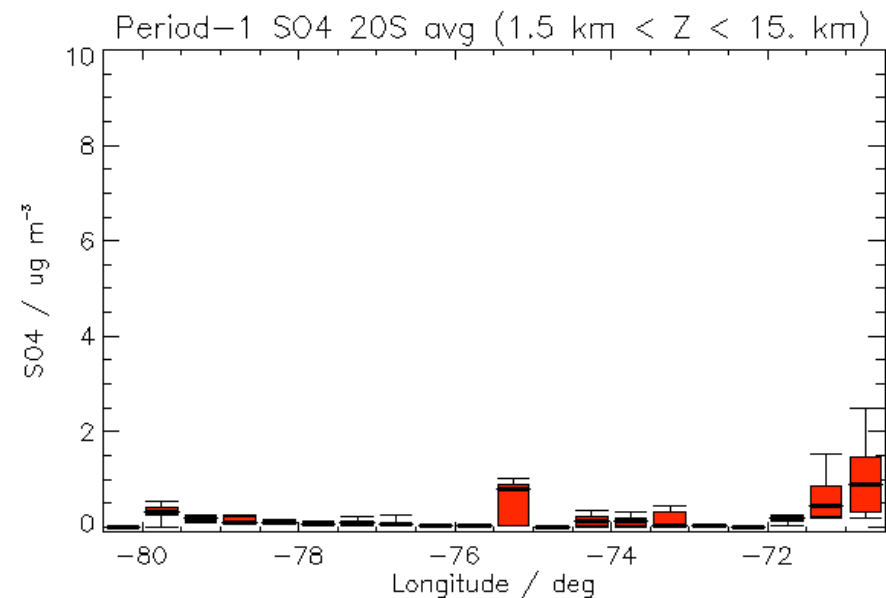
Period 1 (15th – 31st Oct) – Below cloud



Droplet conc, LWC variability, drizzle



Clean free troposphere, compared to MBL – however,
note discrete pollution layers



Summary so far

- Very consistent MBL composition picture has emerged with coastal gradient and clear “transition” region at 74 W for both composition, dynamical and cloud properties
- Free troposphere is variable everywhere, with “rivers of pollution”
- Consistent spatial gradient in cloud properties and Z_{inv} seen – but with intra- and inter-day variability

Way forward / Discussion

- How do we divide/grid/average the data in a way that gives reasonable sampling (and is representative of the intrinsic variability), whilst giving modellers/future users what they would like to use?
 - treat composition data different to cloud/dynamical properties?
 - Temporal (regime) averaging vs sampling compromise
- Investigate sampling statistical significance
 - Treat coastal area (East of 75 W) differently?
- Merge data from all air platforms – keep RHB as a separate product?