Trace gas measurements from SEAC^{4}RS convection flights: Implications for CONTRAST

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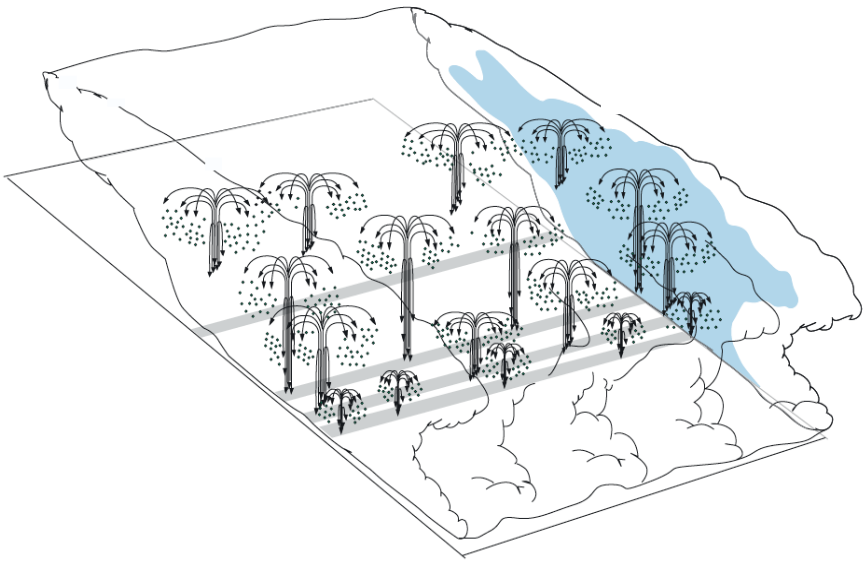

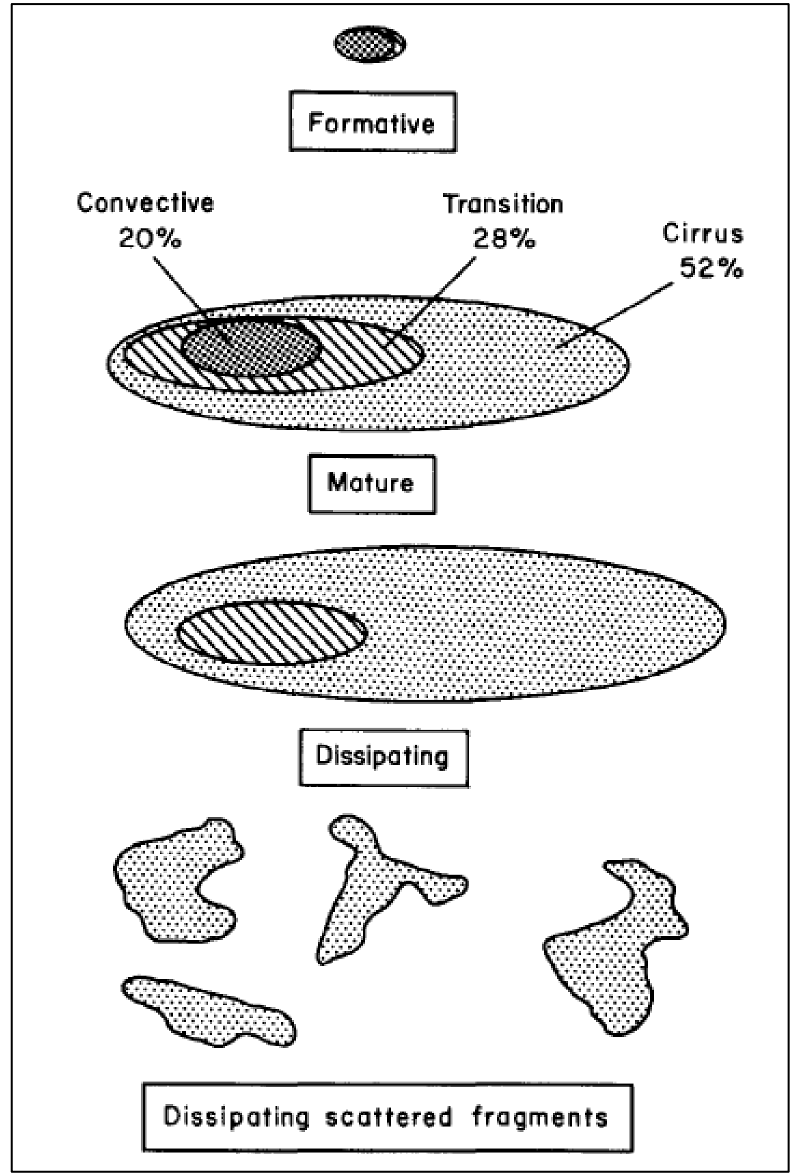

<u>Convective cores</u> (10 m/s):
15 (km)/10 (m/s) = 25 min

<u>Rest of the convective system</u> (1 cm/s):
15 (km)/1 (cm/s) = 17 days

<u>Outside of convection</u> (1 mm/s):
15 (km)/1 (cm/s) = 174 days

which provides a life cycle view of tropical ODC. Climatology of tropical ODC based on CloudSat data is first presented and compared with previous works. Various parameters from CloudSat observations pertaining to cloud vertical extent, convective intensity, and convective environment are analyzed. Although results broadly agree with previous studies, we show that CloudSat CPR is capable of capturing both small cloud particles and large precipitation size particles, thus presenting a more complete depiction of the internal vertical structure of tropical ODC. Geostationary satellite observations are analyzed in conjunction with CloudSat data to identify the life stage of the convective systems (CSs) in which ODC is embedded. ODC associated with the growing, mature, and dissipating stages of the CSs represents, respectively, 66.2%, 33.4%, and 0.4% of the total population. Convective intensity of the ODC is found to be stronger during the growing stage than the mature stage.

ODC ≈ deep convective cores

Characterizing tropical overshooting deep convection from joint analysis of CloudSat and geostationary satellite observations

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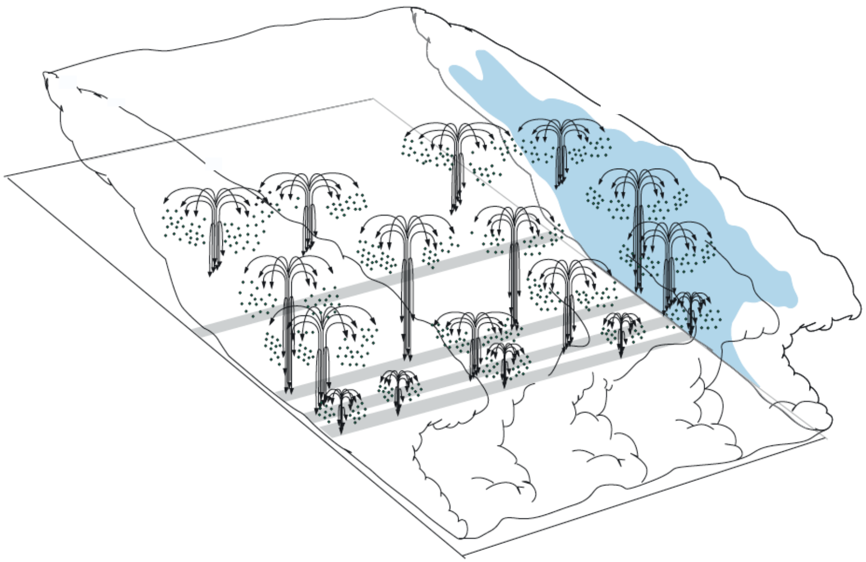
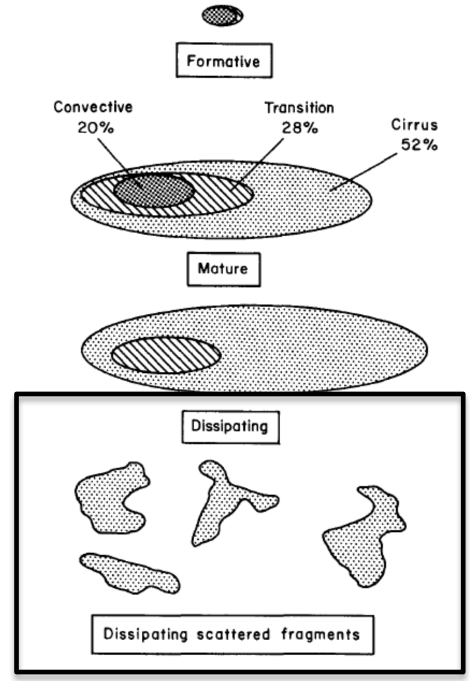
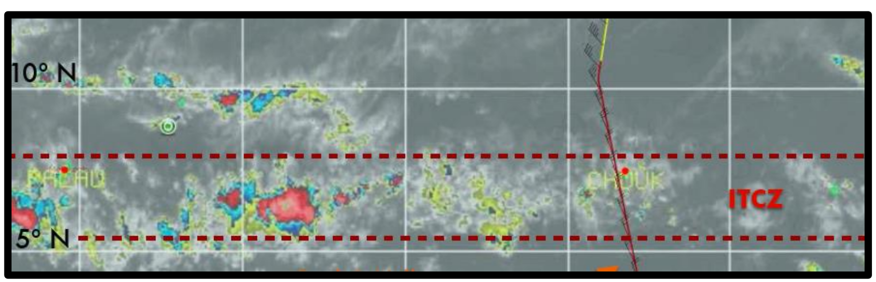


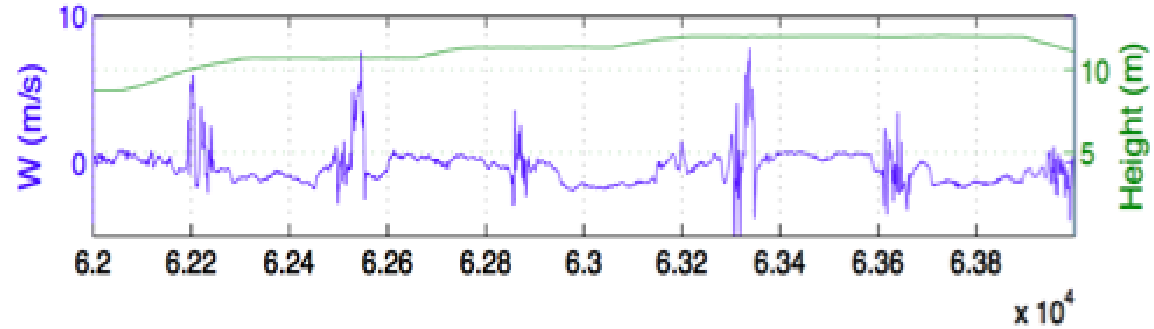


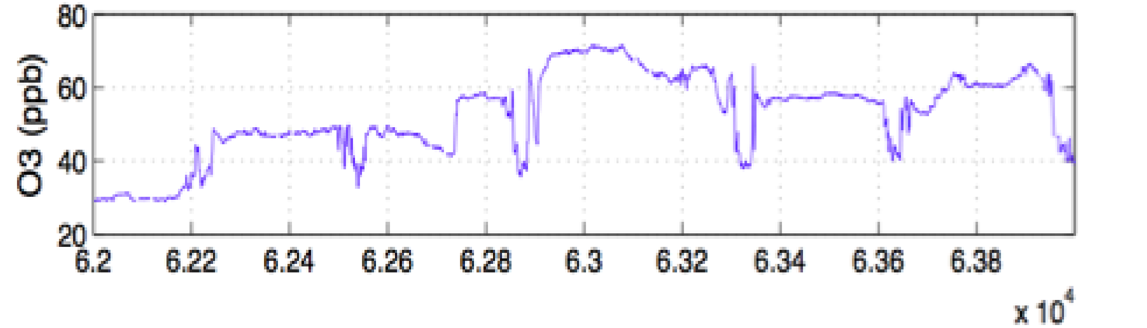
Most realistic for GV

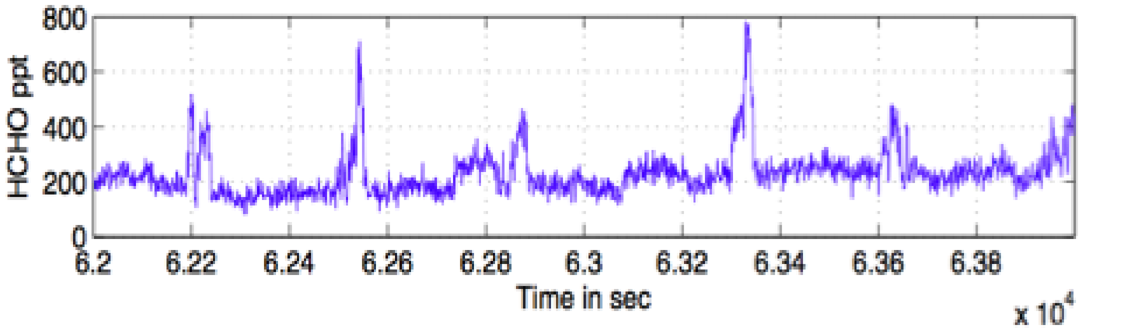


The ITCZ air sampled during RF10 is a “cocktail” of air parcels of different ages.

I suspect that fresh vent (~ 1-2 hr from MBL) only makes up a very tiny fraction of the “cocktail”, if at all.


W (m/s)
Height (m)
10
0
5
6.2 6.22 6.24 6.26 6.28 6.3 6.32 6.34 6.36 6.38
x 10^4

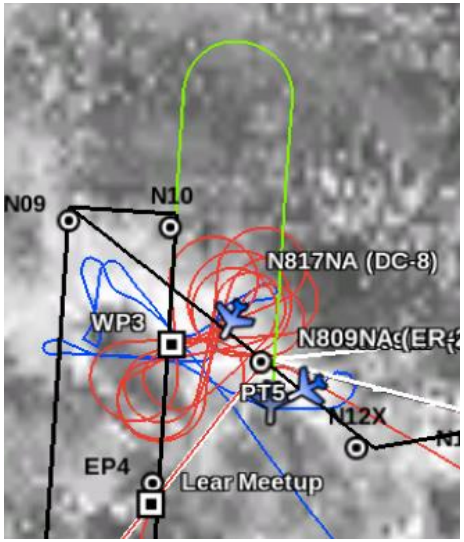

O3 (ppb)
80
60
40
20
6.2 6.22 6.24 6.26 6.28 6.3 6.32 6.34 6.36 6.38
x 10^4

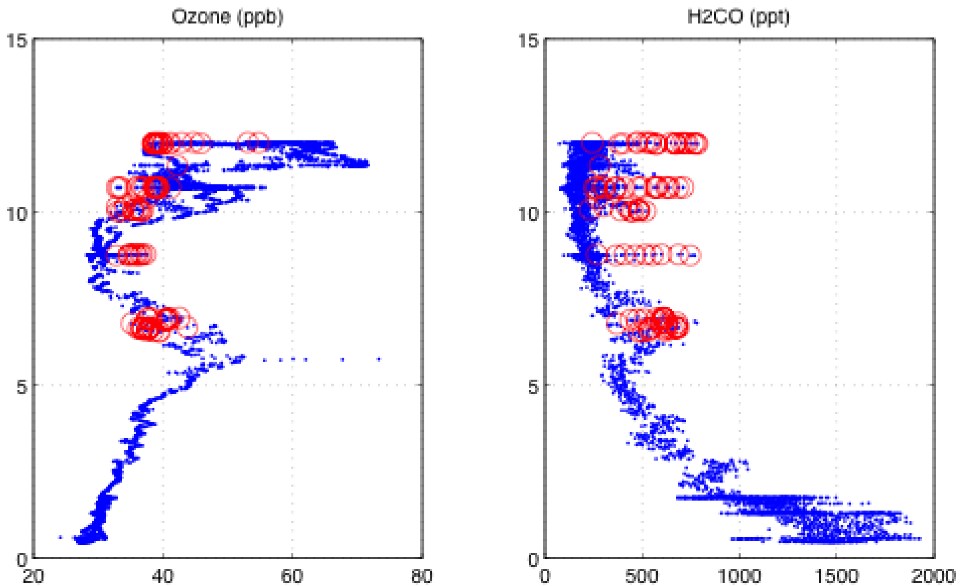

HCHO ppt
800
600
400
200
0
6.2 6.22 6.24 6.26 6.28 6.3 6.32 6.34 6.36 6.38
Time in sec
x 10^4


8 km

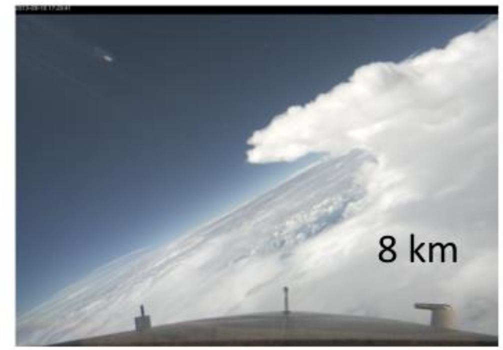

12 km


~ 300 m


N09
N10
N817NA (DC-8)
WP3
PT5
N12X
EP4
Lear Meetup



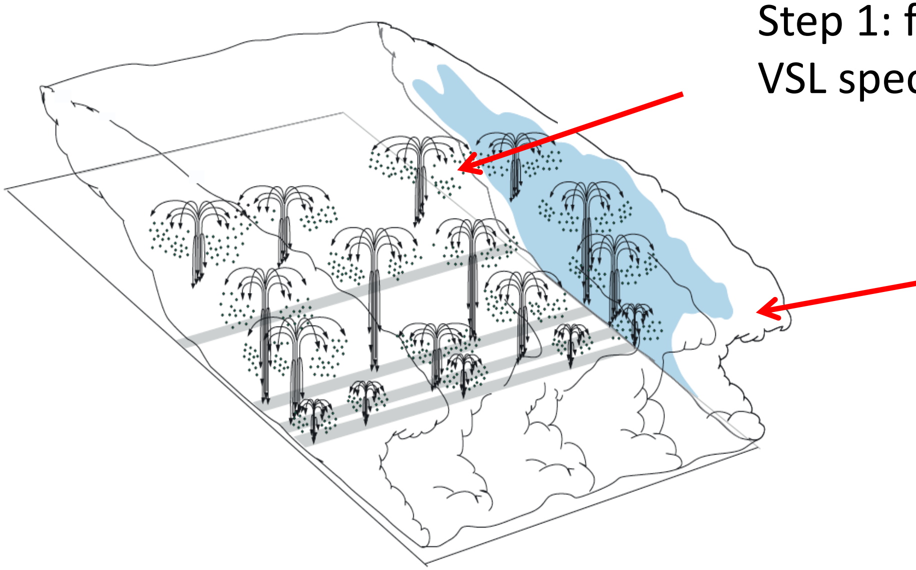
Red circles are data points inside the convective cells



Even inside these deep convective cores, we don't see "undiluted" or "fresh" transports. Possible explanations:

1) The cores don't start from the PBL (Bill pointed out this for ITCZ crossing)

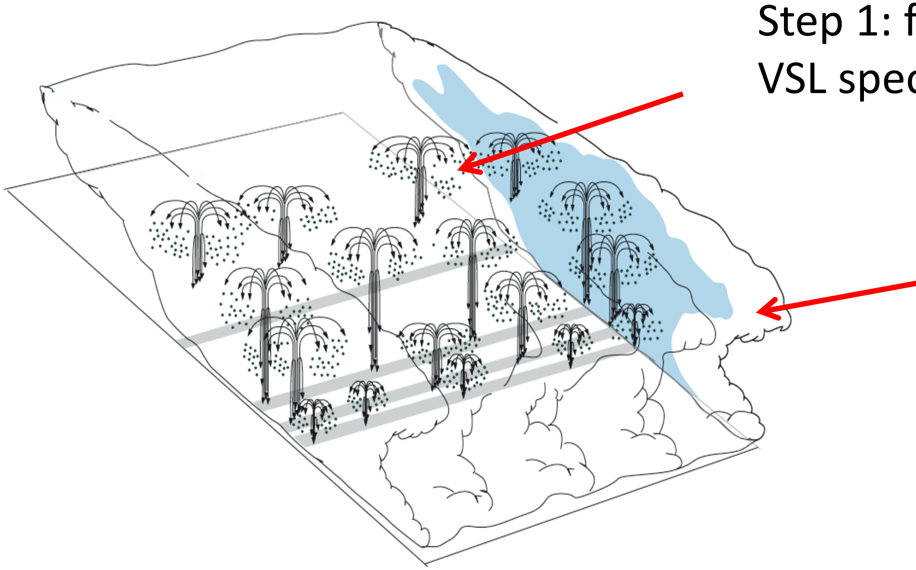
2) Scavenging by rain (HCHO for sure, not sure about ozone)



Step 1: fountains or express elevators deliver VSL species (we can't sample it)

Step 2: air vented by these fountains will make its way to the outflow

(we still can't sample the "fresh" outflow because it's cloudy and may have hidden danger)



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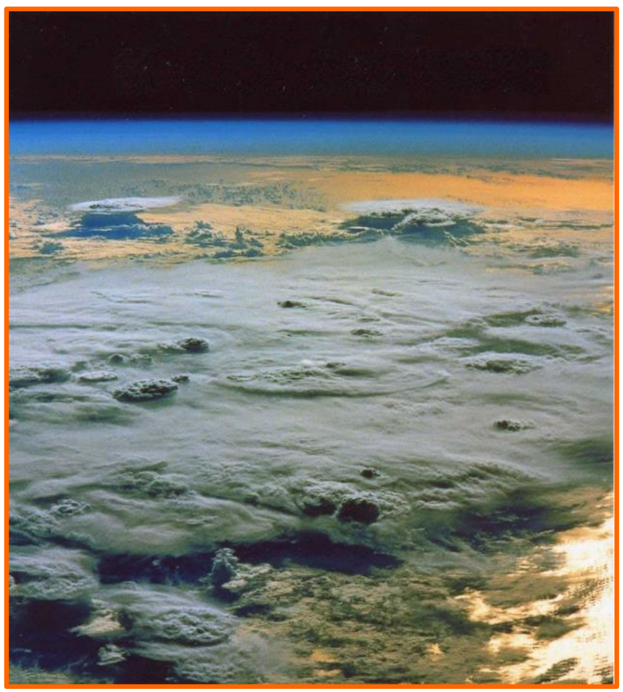

CONTRAST samples air outside the whole convective systems (in between the systems if we are lucky).

As such, there is very little chance to see in the UT "fresh" air vented from the MBL. We see "cocktails". So, I doubt we can see O_3< 5-10 ppb in the UT.

So, we should focus on interpreting what we can observe in the convective environment, instead of chasing pure, fresh outflow.