Mission scientist report  RICO December 20, 2004
Flight RF09 C-130 (20 December 2004)
C-130 Flight Scientist: Rauber
General cloud characteristics:

The cloud field was the most suppressed of any day I have flown. Tops rarely reached 5000 ft and were generally much lower. None of the clouds had visible rainshafts, although the windshield was wet during penetrations above 3400 ft. The cloud field changed little during the flight until the very end, where it appeared more developed toward the east – these deeper clouds were not sampled. There were a lot of clear areas between cloud regions.

General Comments:

This flight adds to the database for statistical studies of shallow tradewind cumulus. We sampled a range of altitudes and specifically targeted clouds that had just recently grew through those altitudes. It should be possible to reconstruct, in a statistical sense, the growth of particles in an air parcel rising from cloud base using this dataset and study processes such as coalescence onset.

SPOL 1439 UTC Surveillance Scan

SPOL 1603 Surveillance Scan
Overview of C-130 Flight Pattern:

1058-1123 UTC  Ferry to circle location climbing to 15000 ft
1123-1313 UTC  Perform circles at 15000 ft, 300 ft and 1000 ft
1313-1334 UTC Calibration maneuvers
1334-1400 UTC Climb to 6000 ft to view clouds, ferry to Barbuda to work clouds near radar
1400-1646 UTC Sample clouds at 4000, 3700, 3400, 3100, 2700, 2400, and 2000 ft altitudes
1646-1838 UTC Circles at 1000 ft, 300 ft, and 15000 ft
1838-1910 UTC Ferry back to Antigua and land

C-130 Flight notes:  UTC time is used

1054  Conditions at airport: lots of clear skies with small clouds.  No precipitation visible in any direction
1058  Takeoff
1101 Cloud base at 1500 ft
1103 Rain on windshield as we pass through 4500 ft
1109 Lots of shallow trade wind cumulus below us, some in streets
1109 Some clouds appear to be topping around 5000 ft.  Most are small
1123 First circle beginning CCW at 15000 ft
1139 Looks visually like there may be some deeper clouds east of Barbuda at about 40-50 miles from the aircraft
1153 Finished 15000 ft circle.
1153 Conditions unchanged – radar reports no significant echoes. There are small trade wind cumulus, some in streets
1206 300 ft circle commencing CCW
1206 Cloud bases are very flat. No precipitation in sight.
1212 Wind speed 9 m/s. Very small trade wind cumulus. Widely scattered with lots of clear space.
1236 End of 300 ft circle. Clouds sparse and weak. Maximum tops I’ve seen are 5500 ft with most way lower than that
1238 None of these clouds look “hard” with cauliflower structure. Rather, they look wispy.
1243 Begin 3rd circle at 1000 ft. Estimated cloud base was 1500 ft.
1303 Clouds are really suppressed today. We are going to do calibration maneuvers right after the 3rd circle
1313 Third circle completed.
1315 We will perform the following maneuvers: Reverse heading, speed maneuvers, and a rapid ascent through cloud base
1333 Heading up for our cloud base penetration. We clipped the edge of the cloud, but decided not to go at it again
1334 Heading up to 6000 ft to view the cloud field and make a plan
1343 The cloud field below is really suppressed – the most suppressed I’ve seen it
1350 Decided to head to the north side of Barbuda where we will penetrate cumulus in close range of SPOL. We have a number of cells in sight
1400 ATC has cleared us to 4000 ft and given us a 2500-4000 ft block to work clouds
1401 Descend to 4000 ft to work clouds near Barbuda
1403 Cloud top near 4000 ft.
1403 Rain on windshield
1408 Cloud tops nearby at about 5000 ft. Rain on windshield
1409 Rain on windshield
1414 Rain on windshield
1423 Descending to 3700 ft to sample clouds at this altitude
1425 Rain on windshield
1428 Rain on windshield
1434 King Air decided not to fly today due to suppressed cloud field
1439 Rain on windshield
1443 Descending to 3400 ft to sample clouds at this altitude
1443 Moving to new area. We were sampling taller clouds over Barbuda. We are now moving 20 km east of Barbuda and sampling clouds there. Most are only up to 4000 ft or lower.
1457 Rain on windshield (very light)
1458 Few towers coming up through 3400 ft
1508 Descending to 3100 ft to sample clouds at this altitude
1513 Rain on windshield (light)
1519 Rain on windshield
1524 Rain on windshield
1533 Descending to 2700 ft to sample clouds at this altitude
1553 Descending to 2400 ft to sample clouds at this altitude
1602 Hitting lots of clouds that are just passing through 2400 ft altitude
1623 Heading to 2000 ft. Will work clouds at that altitude for 15 minutes and then do circles
1623 The cloud field is unchanged from earlier. Small cumulus, no visible precipitation shafts below cloud base visible.
1630 Breaking off to do 1000 ft circle
1642 Approaching circle point at 1000 ft. See no precip shafts under any of these clouds
1646 Started first circle at 1000 ft
1649 Sea state looks rather calm – few foamy whitecaps
1716 Finished first circle – no precip shafts, small trade wind cumulus
1725 Started second circle at 300 ft
1755 Ended second circle at 300 ft
1756 Lots of blue sky out here today – clouds are very suppressed
1808 15000 ft circle starts
1810 Cloud field appears to be developing more. Clouds are still small but more developed than earlier in the flight
1822 Very high cirrus visible to west
1829 Briefly saw a rainbow below us
1832 Cumulus below us appear significantly more developed now. Reaching their afternoon peak in intensity
1838 15000 ft circle ends
1835 Convection is organized in lines to our SE. Looks like tops are much lower.
1910 Land at Antigua
RICO, Flight #rf09
12/20/2004, 10:57:04-19:10:00

Flight track for RF009
RICO, Flight #rf09
12/20/2004, 10:57:04-19:10:00

RF09 Flight profile
RF09 Cloud Penetrations

RICO, Flight #rf09
12/20/2004, 10:57:04-19:10:00

UTC

R/\text{cm}^3

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CONCF_LFC (R/cm^3), 1 s/sec