General cloud characteristics: The cloud field was wispy, with clouds confined to a layer generally less than 1km, weak updrafts and inconsistent top heights. Some evidence of lines within which some turrets extended to 4000 or 4500 ft. We worked an area well out of radar range to stay away from the influence of deep convective towers which dominated along lines following the Islands. This area of deep convection had dominated our flow over the past days, but seemed to be moving away and dissipating toward the west. As a result, elevated moist layers remained evident over our study area with cirroform clouds becoming more evident later, perhaps from cirrus shields being blown off the convection to the west or in association with a frontal system to the north. Certainly a feature of the latter type was evident in the 15000 ft circle late in the flight. Cloud bases in the study area was around 500m, with no evidence of precip below cloud base. Penetrations of clouds with precip (as evidenced by water on windshield, but not necessarily on probe) were rare, but noted on several occasions. As a rule the cloud drop spectra were very narrow on this flight, and appeared to be modulated by a large-scale plume (20-30km wide in places) of more polluted air which was repeatedly crossed by the aircraft. Lidar images showed rather little activity in the cloud layer, manifest in weak cloud layer backscatter.

General Comments: This study will work well in contrast to RF04 where precipitation formed readily, the mean soundings were quite similar, but with a less well developed cloud layer, much more shear below 3km, and much weaker winds at the surface. In addition to wind shear, microphysical contrasts were evident with thermals seemingly less well developed, hints of less liquid water and more varied microphysical characteristics. Also good for probe work, and examination of shattering.

Overview of Flight Pattern: The elevations for flight legs are attached with the figures at the end of this document. In addition to bookend circles flown at 15000 ft (with dropsondes), sub-cloud legs at 1000ft, and surface legs at 300ft, approximately 3.5 hours was spent in the cloud layer. Cloud legs stepped up every 20-40 minutes at roughly 300ft increments. The upper-most leg was near 3300ft, followed by a short
sounding and then stepping down through the layer. In contrast to previous flights we worked a target area near 60.5W, and 18.5N, and our latter circles advected with the flow.

**Notes on high-rate measurements:** Don Lenschow analyzed high-rate data from circles. The Lyman-α was behaving well, but significant roll up was evident in both ATRR and ATRL (the Rosemont temperature sensors). Further analysis and comparison with the 15,000 ft circles show that this roll-up is well above the noise floor and is characterized by cold spikes in the time-series data. These features are most evident when the baseline humidity is high, all of which is suggestive of salt coating of the sensing wire. RAF will begin cleaning sensor wires after every flight to help mitigate these issues, but it is not clear that the problem can be completely avoided. We will continue to monitor the situation.

**Flight Notes:**

Note that some of the reports below may have inconsistent altitudes, due to a lack of correspondance between aircraft altimeter, which pilots used, and altimeter readings from PALT which were the basis for the notes. For better evaluation of heights, cross check with Figure 3.

- **13:52** Taxi (altimeter 2994), showers at end of runway.
  - Windsock indicating Easterly flow.
- **14:00** Wheels Up.
  - Winds 10 m/s at 100°.
  - Cloud base at 500m
- **14:05** Stratiform clouds at 5000 ft.
  - Developing congestus ahead of current heading, deep convection to North
- **14:21** Cleared stratiform layer at 200m, shallow cloud layer with bases near 600m and tops only to 1km.
- **14:25** Flying over shallow banded cloud features.
- **14:32** Started CCW circle at 15,000 ft.
- **14:39** Drop in Lyman-α dew point.
- **14:40** Nice shallow cloud field.
- **14:42** Elongated cloud streets, estimated heading of 300°
  - Moist suitable clouds off of western edge of circles
  - First sondes show winds NNE from 3-5 m/s down to 2km, becoming easterly at low levels ranging from 7-9 m/s.
- **15:03** Beginning descent to 300 ft.
  - Evidence of weak inversions at 950 and 800 hPa, both associated with hydrolapses.
- **15:13** Descended to 2000ft, near cloud base, continuing to 300 ft.
- **15:16** Started SF circle (CCW), winds 5-9 m/s at 80°
- **15:24** Cloud field more developed on Eastern side of circle.
- **15:27** Cloud layer only extends to 1.5km.
- **15:36** High clouds to SE.
- **15:52** Started CW circle at 1300 ft.
- **16:06** Still looks good to east, small clouds but plenty to work with.
  - Marked region of better developed cells at 19.117N, 60.62E.
- **16:25** Cloud penetrations, begin working clouds at 2300 ft.
- **16:35** Penetrating small clouds, no precip.
- **16:35** Ascending for better look of organization, if any.
- **16:47** Cloud penetration
16:50 Descending back to 2450 ft, organization was difficult to entangle on our brief ascent. Ragged bases, no precip on window. Consistent polluted area in souther part of original circles. Clouds thinner than they appear.
16:01 Very small clouds to north.
17:15 Ascent to 2700ft, working area.
17:19 Penetration of cloud with estimated top at 4000 ft.
17:20 Line-like feature, some 2 m/s updrafts, more liquid water.
17:30 Cindy reports pass with 10/liter, 260X, says clouds are becoming more vigorous
17:40 Clouds more vigorous
17:41 Ascending to 3000 ft. and turning back to East heading
17:46 Precip on window
17:50 Cirrus aloft and to southwest.
18:05 Precip on window.
18:15 Ascending to 3300 ft.
18:20 3 m/s updraft
18:33 Penetration of tall cloud, windows clear, coming back for repeat.
18:41 Penetration of budding top.
18:43 Ascending to 6500 ft.
18:47 Descend to 3000 ft to work layer.
18:50 Precip on window.
18:54 Precip on window, good penetration of big cloud, 10/liter on 260X.
19:13 Working level at 2650 ft.
19:22 Area of more vigorous cells.
19:30 Working level near 2000 ft.
19:55 CCW SC circle at 1300 ft.
20:00 Cirrus fall streaks, increasing cirrus to west.
20:24 End circle.
20:27 Start CW SF circle.
21:12 Sounding slow through subcloud layer faster aloft.
21:41 Last dropsonde.
21:43 Begin return Ferry.
21:07 Wheels down
Figure 2: Dropsondes from first (blue) and second (red) legs. Left panel shows $\theta_e$ and $\theta_{e,s}$ right panel shows $u$ and $v$ winds.
RICO, Flight #rf06

Figure 3: Flight altitudes
RICO, Flight #rf06


Figure 4: Flight tracks for RF04
Figure 5: FSSP Droplet Concentrations for RF04
Figure 6: Succession of 1s drop spectra from the fast-FSSP, showing characteristically narrow spectra from RF06.