Atmospheric Sciences UND AEROSPACE

Tropical Rainfall Measuring Mission (TRMM) UND Citation Data

This site contains data collected by the UND Citation II atmospheric research aircraft in support of the Tropical Rainfall Measuring Mission (TRMM). The UND Citation was responsible for in-situ measurements of tropical stratiform and convective precipitation as part of the TRMM ground validation program. Data from the following TRMM Field Campaigns is available online:

TEFLUN-B (ended 15 September 1998)

LBA-TRMM / Brazil (begins 5 January 1999)

TRMM / TEFLUN-B
UND Citation Flight Log

here

Date	Flight Times (UTC)	Participating Facilities	Temp. Range (deg C)	Location	Purpose	Flight Summary
13 Aug 1998	2200-2430 2.5 hrs	ER-2 / DC-8 / C-II / S-Pol	-45 to +2	E-W over Patrick AFB	Coordinated TRMM validation	Worked parts of a line in a stair step climb from +2 to -45 C. Interesting data below and in the melting level.
15 Aug 1998	2021-2051 0.5 hours	ER-2 / DC-8 / C-II / S-Pol / TRMM	N/A	Patrick AFB	TRMM underflight	Mission aborted due to on-board weather radar failure.
20 Aug 1998	1630-2010 3.7 hours	DC-8 / C-II / S-Pol / TRMM	-28 to +4	NW-SE line SE of Cape Canaveral	TRMM underflight	Two stair step climbs with spiral descents. TRMM overpass during second spiral. Coordinated flight with DC-8.
21 Aug 1998	2245-0030 1.7 hours	C-II / S-Pol	-15 to +5	E of Melbourne	TRMM convective	Stair step up and spiral down in two moderate cells east of S-Pol. Cells were isolated, but part of larger line.
22 Aug 1998	1655-1900 2.1 hours	C-II / S-Pol / TRMM	-15 to +15	NE of Cape Canaveral	TRMM underflight	Spiral up and down through one cell then stair step up through precip regions during TRMM overflight
26 Aug 1998	2200-2318 1.3 hours	C-II	+10	Near Sebring	HVPS test flight	Sampled moderate cell at lower levels
27 Aug 1998	2200-2315 1.2 hours	C-II / S-Pol	-8 to +8	Over Lake Okeechobee	TRMM Convective & HVPS test	Sampled isolated cumulonimbus from 11,000 to 20,000 ft through melting level and ice crystals
29 Aug 1998	1335-1646 3.2 hours	C-II / TRMM / S-Pol	+15 to +20	E of Melbourne	TRMM underflight & wind calibration	Wind calibration maneuvers. Sampled small cumulus during TRMM overflight Also sampled some cirrus at 29,000 feet
						Rain bands of hurricane

2 Sept 1998 #1	1844-2130 2.8 hours	ER-2 / DC-8 / C-II	-14 to +1	Gulf of Mexico Tampa to Tallahassee	Coordinated TRMM microphysics	Earl. Spiral from 12k to 20k feet. Penetrated 2nd line at 3 levels. Encountered occasional severe turbulence.
2 Sept 1998 #2	2228-0046 2.3 hours	C-II / S-Pol	-18 to +7	Near St. Lucie	Ferry from TLH / S-Pol mission	Sampled back (west) side of decaying thunderstorm. Flew five legs from 11k to 26k feet.
5 Sept 1998	1911-2201 2.8 hours	ER-2 / DC-8 / C-II / S-Pol	-18 to +6	E of Melbourne	TEFLUN dissipating stratiform	Three penetrations of convective towers then 2 lines of stratiform precip at +5, +1, -2, and -5 C
8 Sept 1998	1929-2159 2.5 hours	ER-2 / C-II / S-Pol	-20 to -2	W of Orlando	TRMM convective	Flew N-S line, four legs -2 to -20 C. One stronger cell at midpoint with graupel and strong up & downdrafts. Took lightning strike at edge of decaying cell.
10 Sept 1998	2315-0008 0.8 hours	C-II	-10 to +4	W of Lake Okeechobee	HVPS test	Sampled from -10 to +4 C in cumulonimbus
13 Sept 1998	2022-2140 1.3 hours	DC-8 /C-II / S-Pol	-6 to -1	E of Patrick AFB	DC-8 intercomparison	Flew roughly same path as DC-8 about 0.5 - 1 mile apart
14 Sept 1998 #1	1434-1621 1.8 hours	C-II / S-Pol	-13 to +14	E of Patrick AFB	S-Pol mission	Several penetrations of tower from -5 to -13 C, then sampled rain at +5, +7 C. Spiraled up to -5 then down to +14 C. Good mission over water.
14 Sept 1998 #2	2032-2337 3.1 hours	DC-8 / C-II / S-Pol	-10 to +6	E of Melbourne	TRMM convective & stratiform	Two lines, spiral down in stratiform. Three passes through tower. Spiral in light stratiform precip. Penetrated a series of 6 towers.
15 Sept 1998 #1	1609-1739 1.5 hours	C-II / S-Pol	-8 to +2	W of Melbourne	S-Pol mission	Several penetrations N-S of two towers that merged and passed directly over the profiler network. Several penetrations of second cell from +1 to -2 C.
15 Sept 1998 #2	1920-2230 3.2 hours	DC-8 / C-II / S-Pol	-28 to +4	SW of Melbourne	TRMM convective	Five passes NW-SE from -9 to +4 C then spiral up to -15 C. Six passes, -9, -17, and -28 C in second line.

TRMM / TEFLUN-B
UND Citation Instrument Status Matrix

Date	INS	GPS	Video	Liq-H_2O	FSSP	1D-P	2D-P	2D-C	CPI	HVPS
13 Aug 98		N	N			N	N			X
15 Aug 98							X			X
20 Aug 98	P						X		P	X
21 Aug 98						P	X	P	P	X
22 Aug 98										X
26 Aug 98			N				X			N
27 Aug 98							X		P	
29 Aug 98							X			
2 Sept 98 #1							X		P	N
2 Sept 98 #2							X			N
5 Sept 98							X		P	P
8 Sept 98							X	P		P
10 Sept 98				N			X	P		P
13 Sept 98							X			
14 Sept 98 #1			N				X			
14 Sept 98 #2							X			
15 Sept 98 #1							X			
15 Sept 98 #2							X			

Legend:

	Normal Operation
P	Partial Data
N	No Data
X	Not Installed

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

Flight Log
Instrument Status
Home

UND Citation Flight Summary

Date/Flight Number
13 August 1998

Period of Flight/Total Time
2200-2430 UTC
2.5 hours

Flight Scientist
J. Stith

Crew
K. Streibel, R. Miller, P. Lawson, S. Spears

Weather Observations
Cb near field

Photos Taken
None - Video inop.

Purpose of Flight

TRMM - Coordinated mission with ER-2 and DC-8 - 3 aircraft were to fly a line E-W.

Malfunctions and Data Quality Observations

No 2D-P
No 1D-P (noise in all channels)
No GPS on DAS
Good CPI data
Time on SEA started +1 sec fast compared to CPI, ended +2 sec faster

Observations and Flight Description

Missed first hour of coordinated flight due to ATC hangup and fooling around with radio. However, managed to work parts of the line from +2 C to -45 C in stair step climb. Saw dozens of different varieties of habits and particle types - very interesting. Interesting data below and in the melting level. Should be interesting - though coordination with other aircraft needs improvement. Finished with a spiral descent through some clouds on the way home.

TRMM / TEFLUN-B

Flight Summary

Quicklook Data

Flight Log
Instrument Status
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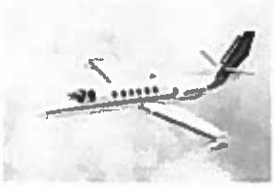
UND Citation Flight Scientist Notes

Date/Flight Number
13 August 1998

21:46:40	CPI time is 1 second behind SEA
21:47	Holding for clearance
21:50	No GPS
21:55	Takeoff
22:05	Setting up for initial points
22:33	Starting run T=+1 C
22:35	Deviation for strong cell
22:37	Starting in again - some graupel and raindrops
22:41	Patch of needles
22:47	Climb from 14,000 to 16,000 (-1.3 C)
22:53	16,000 to 18,000 (-5 C)
22:59	Out of 18,000 for 20,000. Last run had columns, aggregates
23:03	Starting in coud at -9 C
23:07	Next run at -15 C
23:08	At -18 C now
23:20	-22 C run at 26,000 ft
23:24	-28 C run
23:27	Ice on boots
23:34	Back in cloud at -29 C
23:37	Climbing pass through cloud in layers -35 C
23:40	In cloud -38 C
23:51	In cloud -46 C
00:00	Trying to get clearance to go home
00:05	Start spiral descent through cloud at -33 C
00:18	Return to base - probes off

TRMM / TEFLUN-B

13 August 1998 Quicklook Data



Flight Summary
Flight Scientist Notes

Flight Log
Instrument Status
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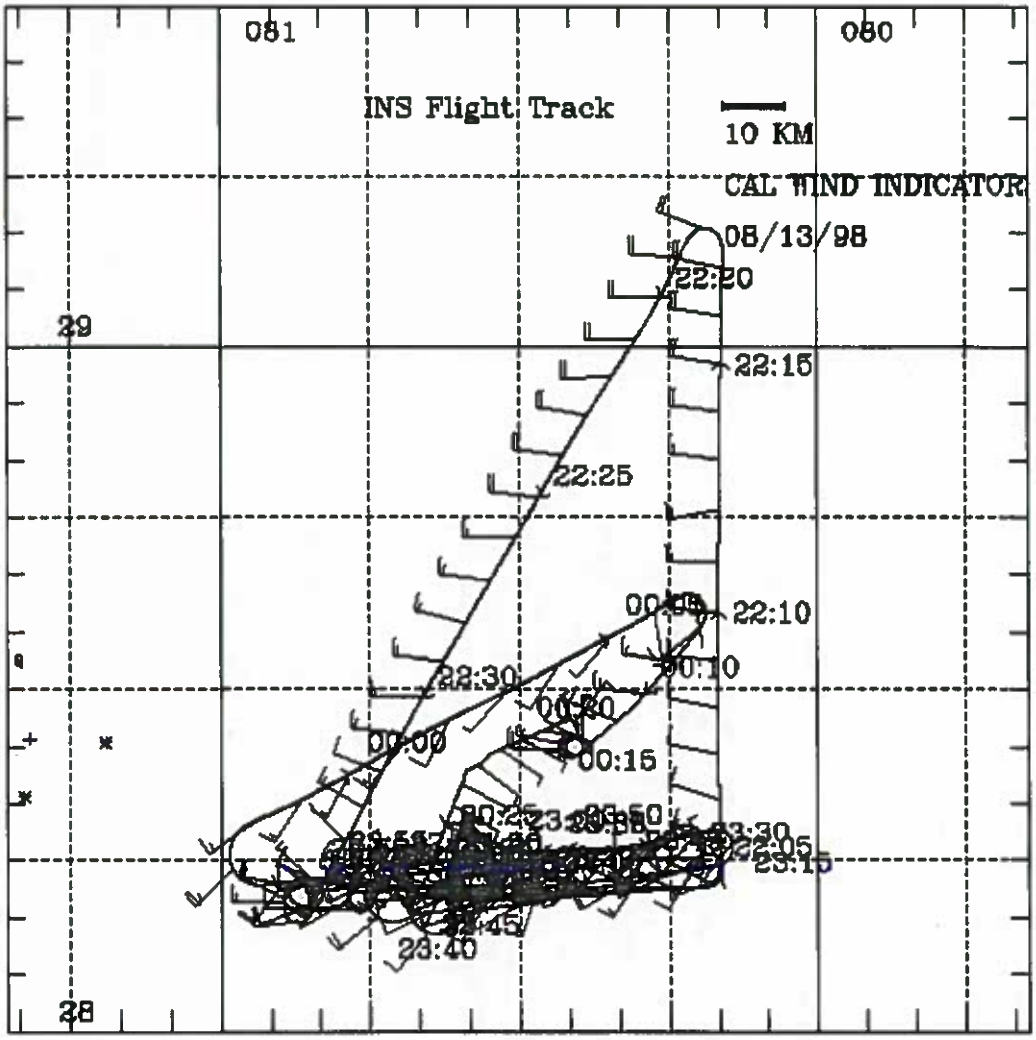

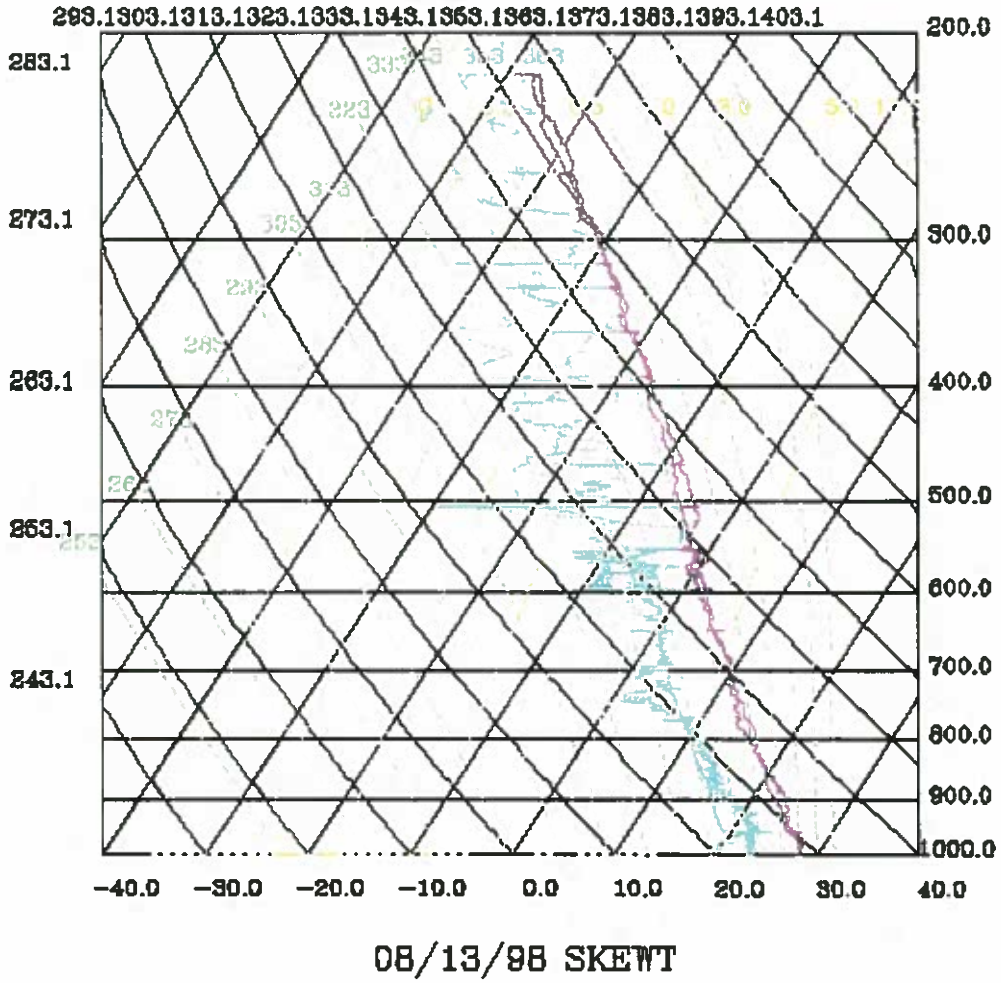
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TRMM / TEFLUN-B

Flight Log
Instrument Status
Home

UND Citation Flight Summary

Date/Flight Number
15 August 1998

Period of Flight/Total Time
2021-2051 UTC
0.5 hours

Flight Scientist
T.Grainger

Crew
K.Streibel, R.Miller, S.Spears

Weather Observations
Line of Cu near Orlando

Photos Taken
Front facing video

Purpose of Flight
TRMM - Satellite overflight

Malfunctions and Data Quality Observations
Mission aborted due to on-board radar failure

Observations and Flight Description
All instruments looked good 2D-P was sent off to Boulder for repair yesterday. Nothing worthwhile except a sounding to 14,000'

TRMM / TEFLUN-B

Flight Scientist Notes

Flight Log
Instrument Status
Home

UND Citation Flight Summary

Date/Flight Number
20 August 1998

Period of Flight/Total Time
1630-2010 UTC
3.7 hours

Flight Scientist
J. Stith

Crew
K. Streibel, R. Miller, S. Spears

Weather Observations
Offshore convection

Photos Taken
Video

Purpose of Flight
TEFLUN-B TRMM
Coordinated flight with DC-8 and TRMM overflight

Malfunctions and Data Quality Observations
No 2DP
Display on CPI says they are 1 sec behind SEA, serial string says about 2 sec slow. End flight CPI says they are 5 sec behind SEA.
INS lost power (went on battery) and was on for only 1st half of flight.
CPI hung several times.

Observations and Flight Description
A good mission. Stairstep climb and then a spiral between melting level and 27,000. Then a second spiral and stairstep in a separate area. DC-8 was above us the whole flight. TRMM passed over at 3 pm local (1900 Z) during the second spiral. We were in cloud / precipitation nearly the whole flight - should be lots of data. Precip was very efficient at removing LLC - small LWC only. Need to see if CPI was able to recover from hangup alright - it cannot handle rain (attenuated two smaller lasers too much)

TRMM / TEFLUN-B

Flight Summary

Flight Log
Instrument Status
Home

UND Citation Flight Scientist Notes

Date/Flight Number
20 August 1998

16:30 Takeoff and climb
16:36:42 Start rain
16:40:20 Some noise in 2DC here - cleared up
16:43 CPI locked up - reboot
16:45 Descend to 12,000 ft
16:52 Turn and repeat run
16:54 Moderate turbulence - rain
17:04 INS on battery - may have lost INS power
17:11 16,000 ft in cell -3 C
17:15 Reverse course and climb to 18,000 ft
17:17 Capped cloumns, columns, plates and aggregates
17:30 INS turned off
17:35 Losing pitot nose for about 15 seconds
17:38 Switch to pitot wing
17:51 Cloud has become stratiform - will drop to 22,000 ft and let DC-8 do top part.
18:15 Completed a run at 14,000 ft (-1 C) starting now 16,000 ft (-3 C)
18:20 Will descend to 13,000 ft
18:28 Pitot nose was out for ~1 min (using wing)
18:33 At +1 C partially melted crystals will head to new area for spiral up
18:51 Spiraling up CPI not working warmer than freezing - occasional noise on 2DC
19:09 Finish spiral from 10,000 ft to 29,000 ft during TRMM overflight - will commence stair step down on new coordinates
19:15 Finish run at 29,000 descend to 25,000
19:25 Finish run at 25,000 descend to 21,000
19:32 Finish run at 21,000 descend to 17,000
19:41 Finish run at 17,000 descend to 11,000 - rain
20:10 Land

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

Flight Log
Instrument Status
Home

UND Citation Flight Summary

Date/Flight Number
21 August 1998

Period of Flight/Total Time
2245-0030 UTC
1.7 hours

Flight Scientist
J.Stith

Crew
K.Streibel, R.Miller, E.Zipser, S.Spears

Weather Observations
Band of cells over ocean moving toward us.

Photos Taken
Video

Purpose of Flight
TRMM – convective mission with S-Pol only. Worked isolated cells that went into large anvil (just above us about 4000' at 29000'). S-Pol was doing scatter scans in our area.

Malfunctions and Data Quality Observations
No 2DP – 2DC was out for a few minutes – see notes. 1DP stuck on all channels during return to base. CPI hung once.

Observations and Flight Description
Did stairstep climb between 10000' and 29000' in moderate cell east of S-Pol. Had a few strong updrafts in cells. Selected a second cell and did spiral down. So we have two vertical profiles through two somewhat isolated cells (part of larger line however)

TRMM / TEFLUN-B

Flight Summary

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UND Citation Flight Scientist Notes

Date/Flight Number
21 August 1998

22:46:00 Ready for takeoff. CPI is 2 seconds slow
23:08:21 Setting up on cell offshore
23:06 Just finished pass at +5 C
23:10 Second pass
23:14 Pass at 16,000 ft -2 C
23:23 Next pass at 20,000 ft
23:28 Next pass at 23,000 ft -15 C
23:29 Software time out on SEA
23:32 2DC inoperative for a while
23:45 Can't get clearance for higher
23:57 Will spiral down through last cell
00:29 Return to base after spiral from 29,000 to 10,000 in cloud 1DP hung up at high counts vs. 2DC

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

Flight Log
Instrument Status
Home

UND Citation Flight Summary

Date/Flight Number
22 August 1998

Period of Flight/Total Time
1655 – 1900 UTC
2.1 hours

Flight Scientist
Stith

Crew
Streibel, Miller, Heymsfield, Spears

Weather Observations
Cells were partially embedded

Photos Taken
Forward video

Purpose of Flight
TRMM overflight at 1400 (local)
1800 UTC

Malfunctions and Data Quality Observations
CPI probe inop at warm temperatures.
2DP on today.
Coordinated sampling with S-Pol, we were a bit far away during latter part of flight.

Observations and Flight Description
Did spiral up through lower levels of one cell and spiral down then up through precip regions during TRMM overflight. Had some LWC in moderate updrafts for lower parts of cloud. Good low level sampling with precip probe.

TRMM / TEFLUN-B

Flight Summary

Quicklook Data

Flight Log
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UND Citation Flight Scientist Notes

Date/Flight Number
22 August 1998

17:00 Setting up first pass 10,000 ft +7 C rather isolated cell
17:11 Second pass descending to 7,000 ft for rain
17:16 Third pass
17:25 Starting in at +13 C
17:33 Start pretty good cell
17:41 Spiral up through cell
17:48 King probe on
17:56 Start descent spiral in cell for overflight
18:05:50 2DP should have more here?
18:10:19 No 2DP here?
18:15 Finished cell and start another to NW - will spiral up
18:22 Trying for higher
18:32 Second pass at 11,000 done, now 15,000
18:35 No histogram display on 2DP
18:44 Return to base - got one more pass at 19,000 before low fuel
18:57 Some noise on 2DP
18:59 Probes off

TRMM / TEFLUN-B

Flight Summary
Flight Scientist Notes

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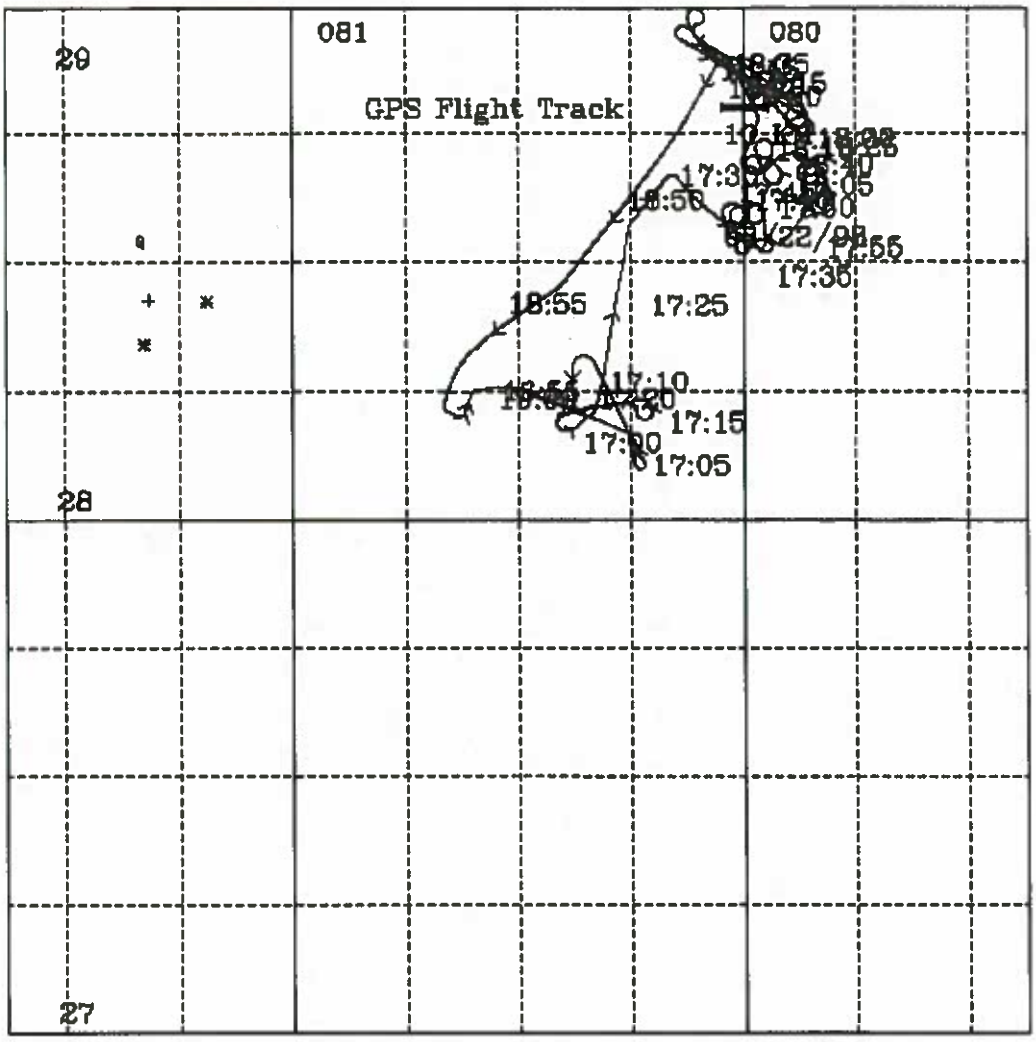
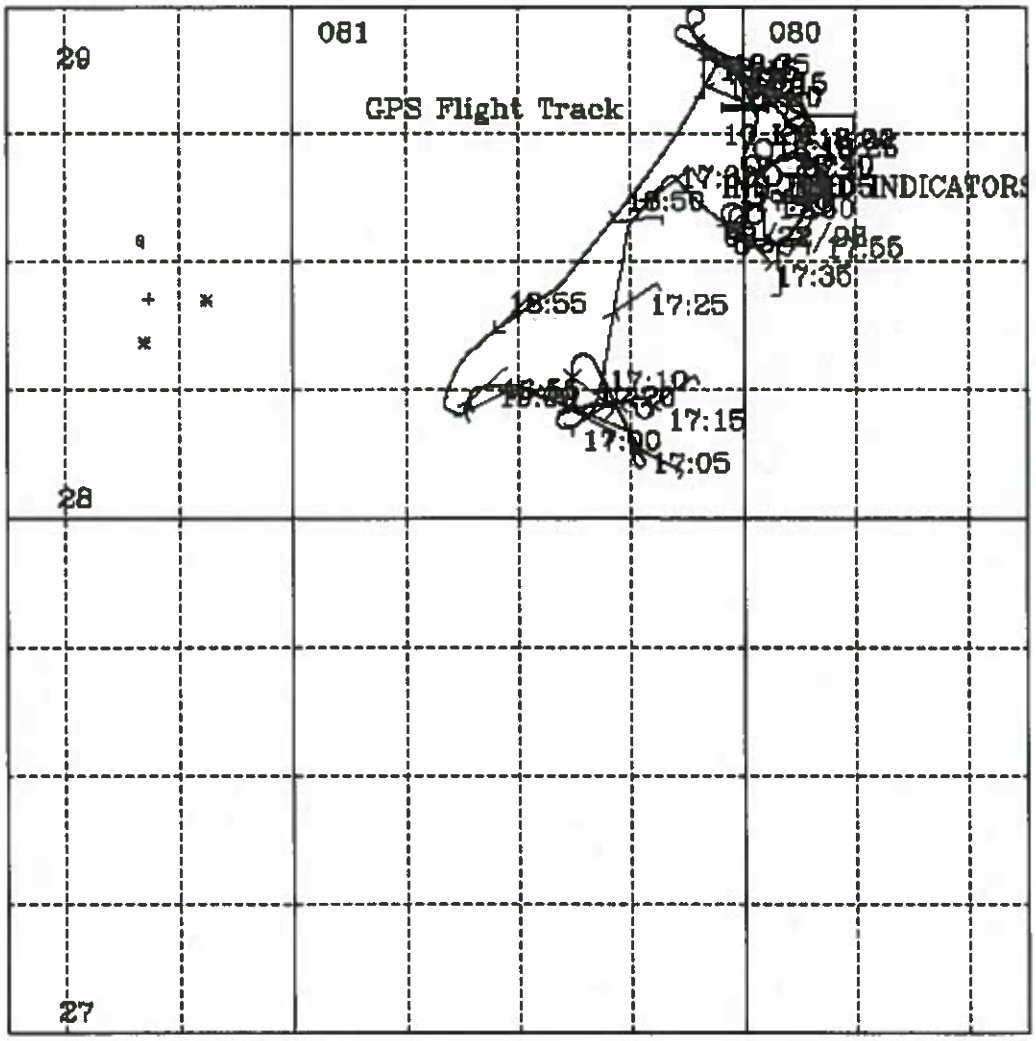
22 August 1998 Quicklook Data

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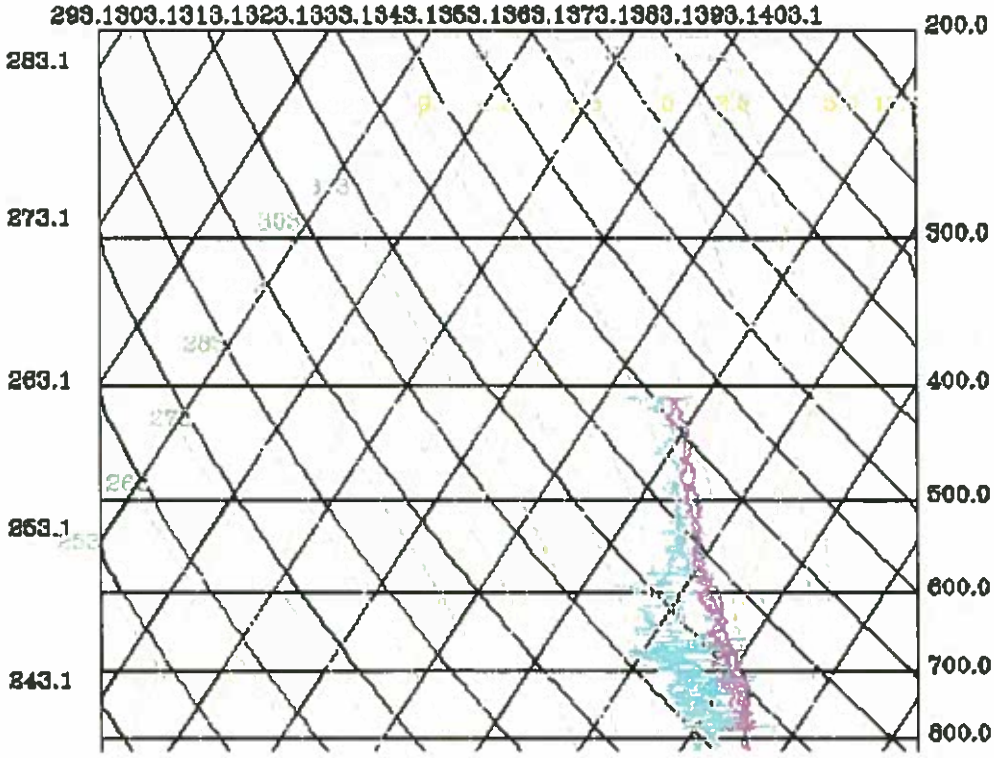
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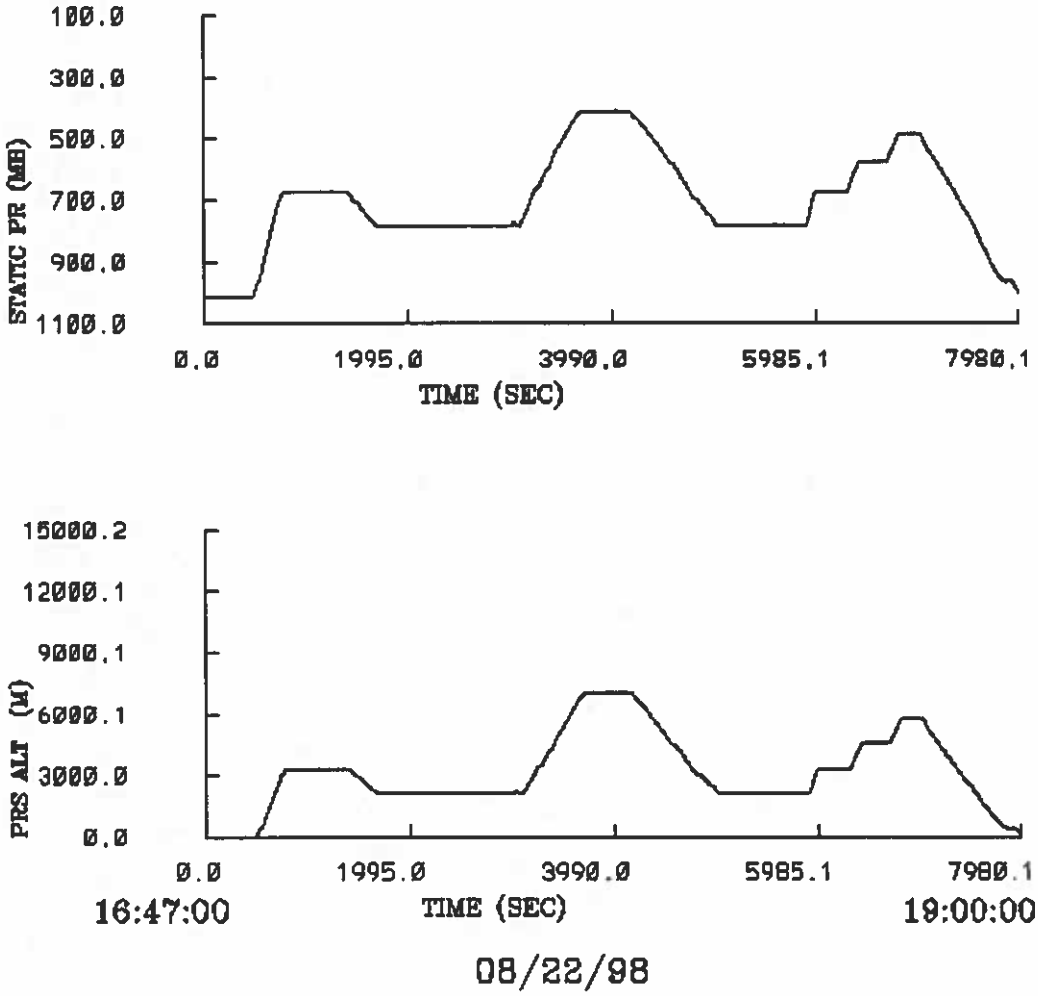
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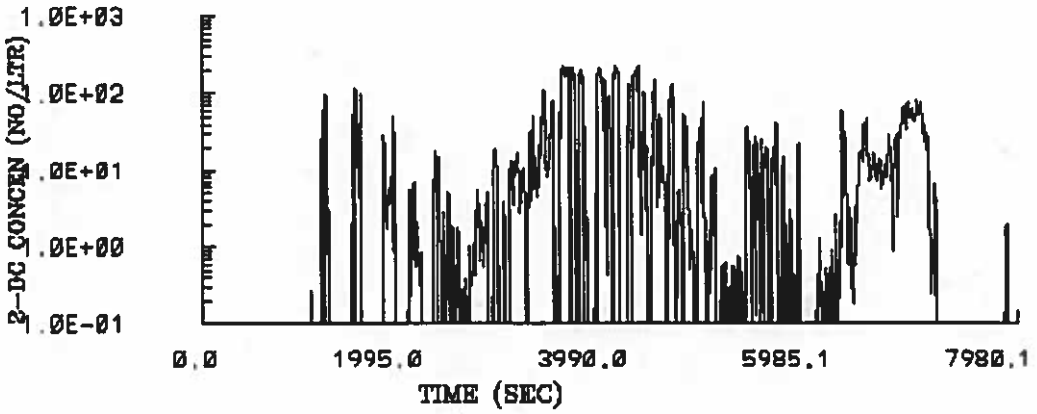
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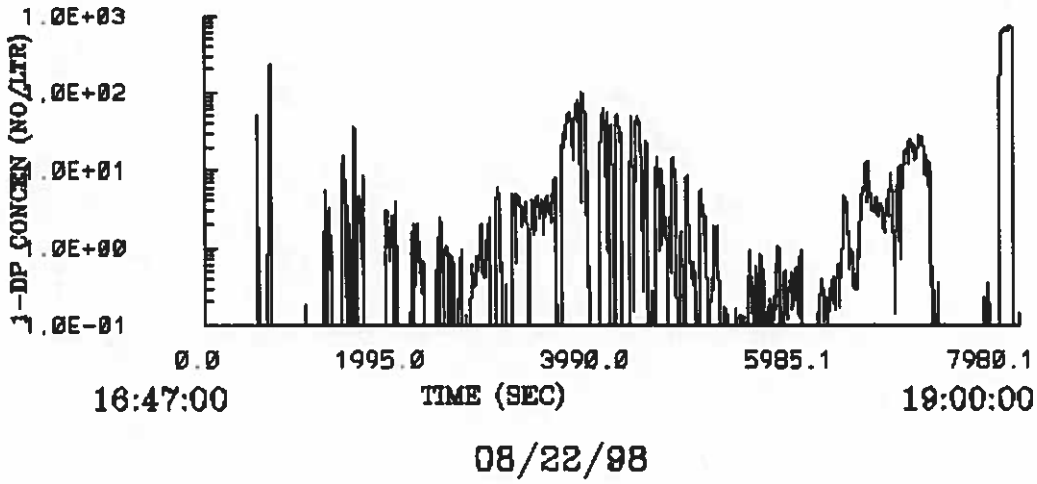
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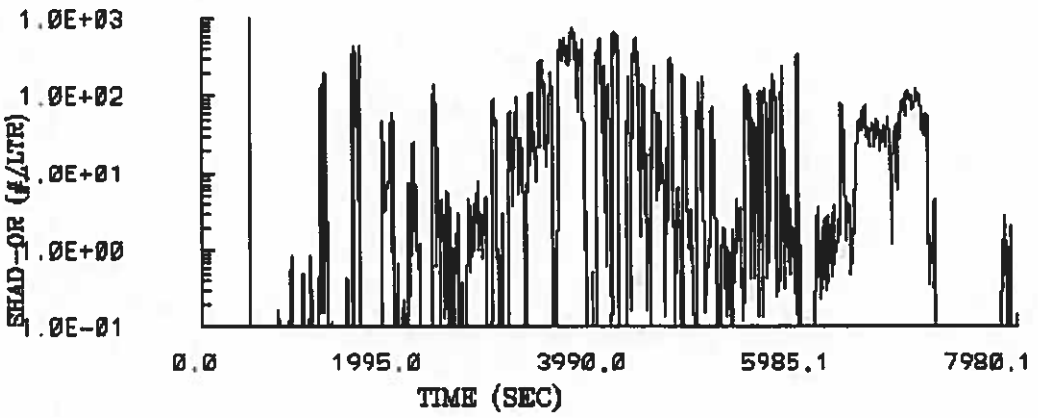
08/22/98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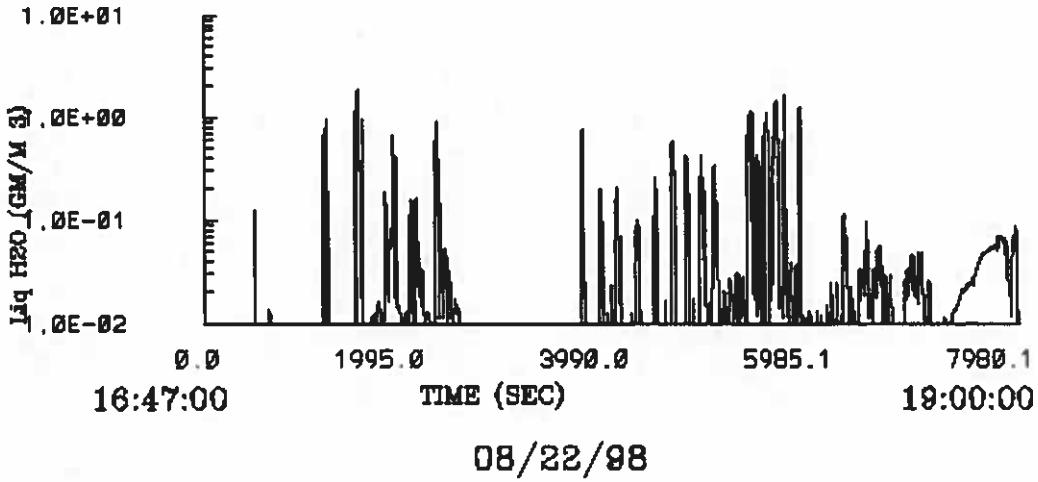
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08/22/98

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

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Instrument Status
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UND Citation Flight Summary

Date/Flight Number
26 August 1998

Period of Flight/Total Time
2200-2318 UTC
1.3 hours

Flight Scientist
Stith

Crew
Streibel, Miller, Spears, Lillie

Weather Observations
Cu in southwest rather far away

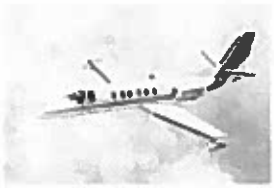
Photos Taken
No video

Purpose of Flight
TRMM test of HVPS probe

Malfunctions and Data Quality Observations
No video
DAS off early to troubleshoot
HVPS needs more work

Observations and Flight Description
Went to a moderate cell and got adequate precip to trigger probes. HVPS did not display images and gradually lost housekeeping data.

TRMM / TEFLUN-B



Flight Summary

Quicklook Data

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Instrument Status
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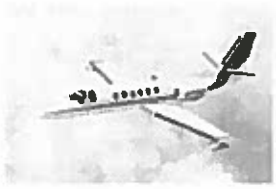
UND Citation Flight Scientist Notes

Date/Flight Number
26 August 1998

22:00 Takeoff
22:13 Looking for clouds
22:34 Starting in cloud at 10,000 feet
22:46 Starting second cell
22:53 HVPS has shadow-or but no images. Data system off for testing
23:03 Return to base
23:18 Land

TRMM / TEFLUN-B



Flight Summary
Flight Scientist Notes

Flight Log
Instrument Status
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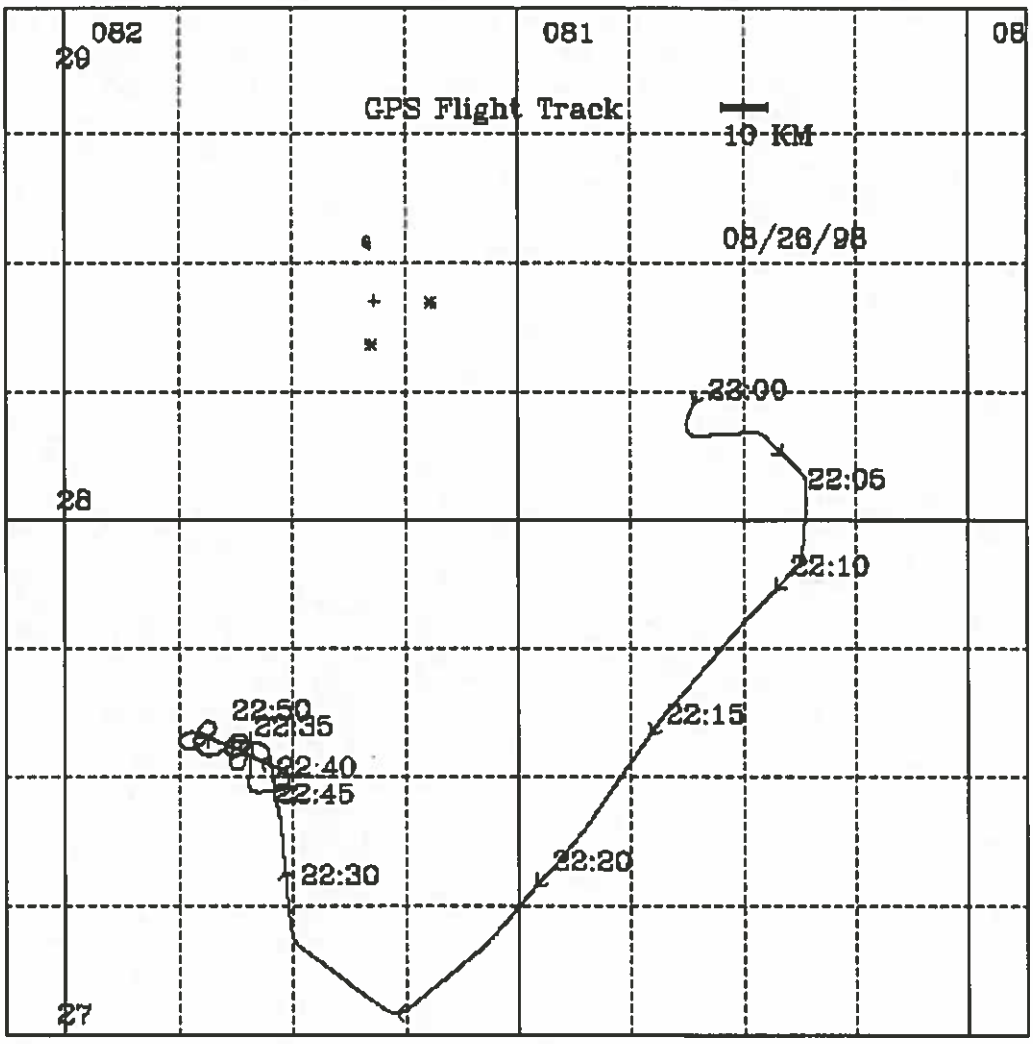
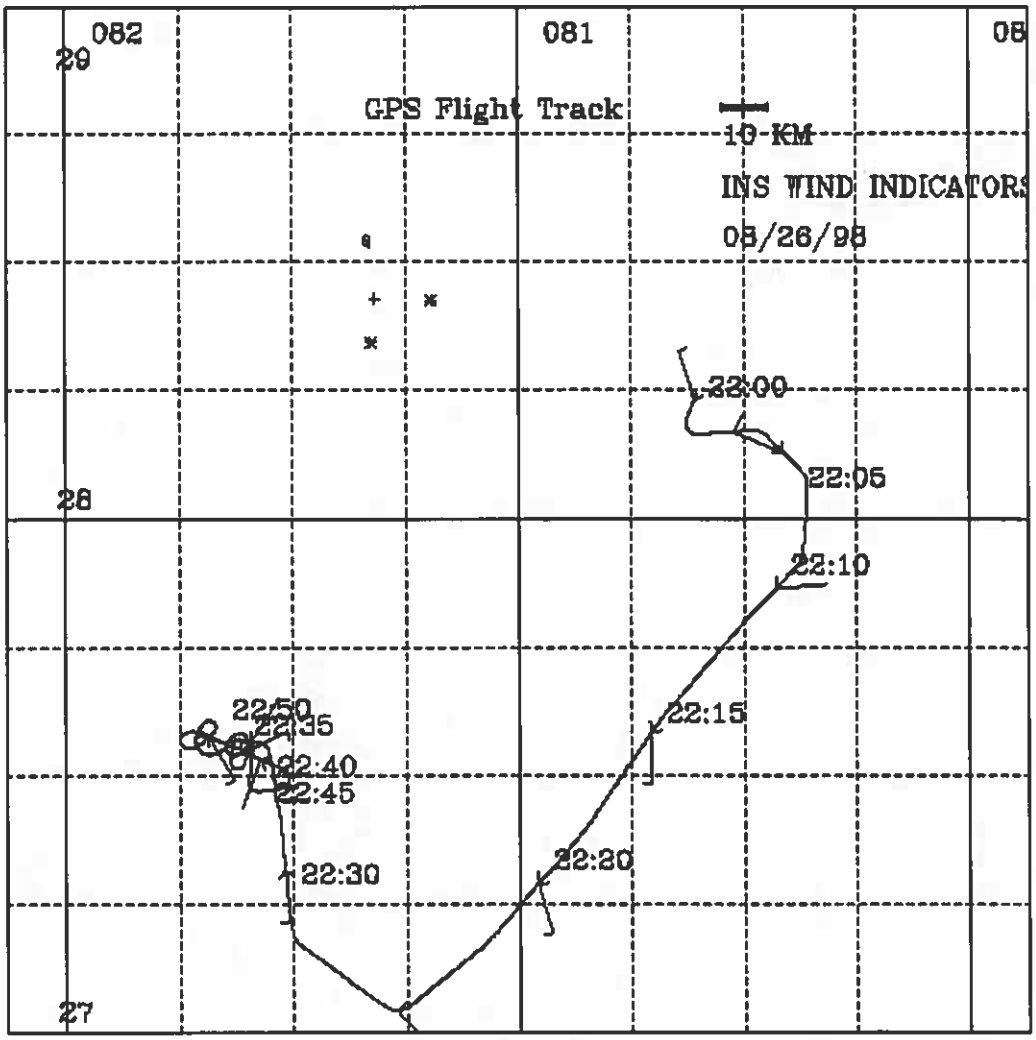
26 August 1998 Quicklook Data

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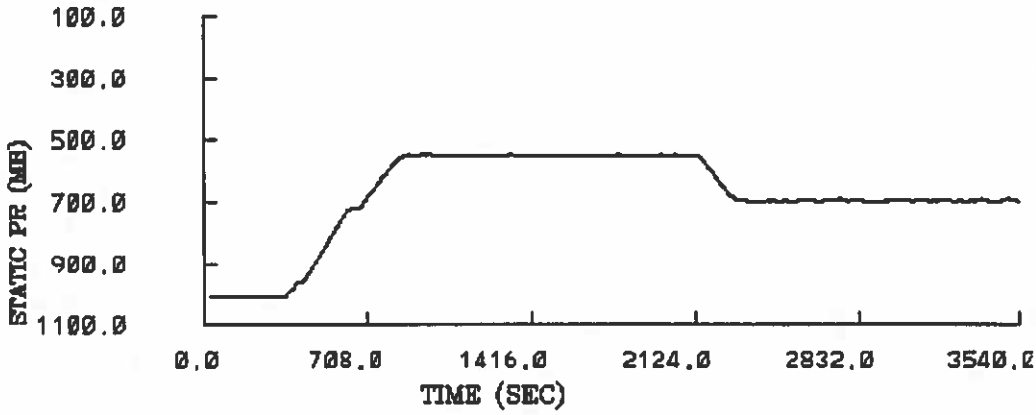
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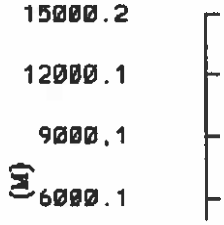
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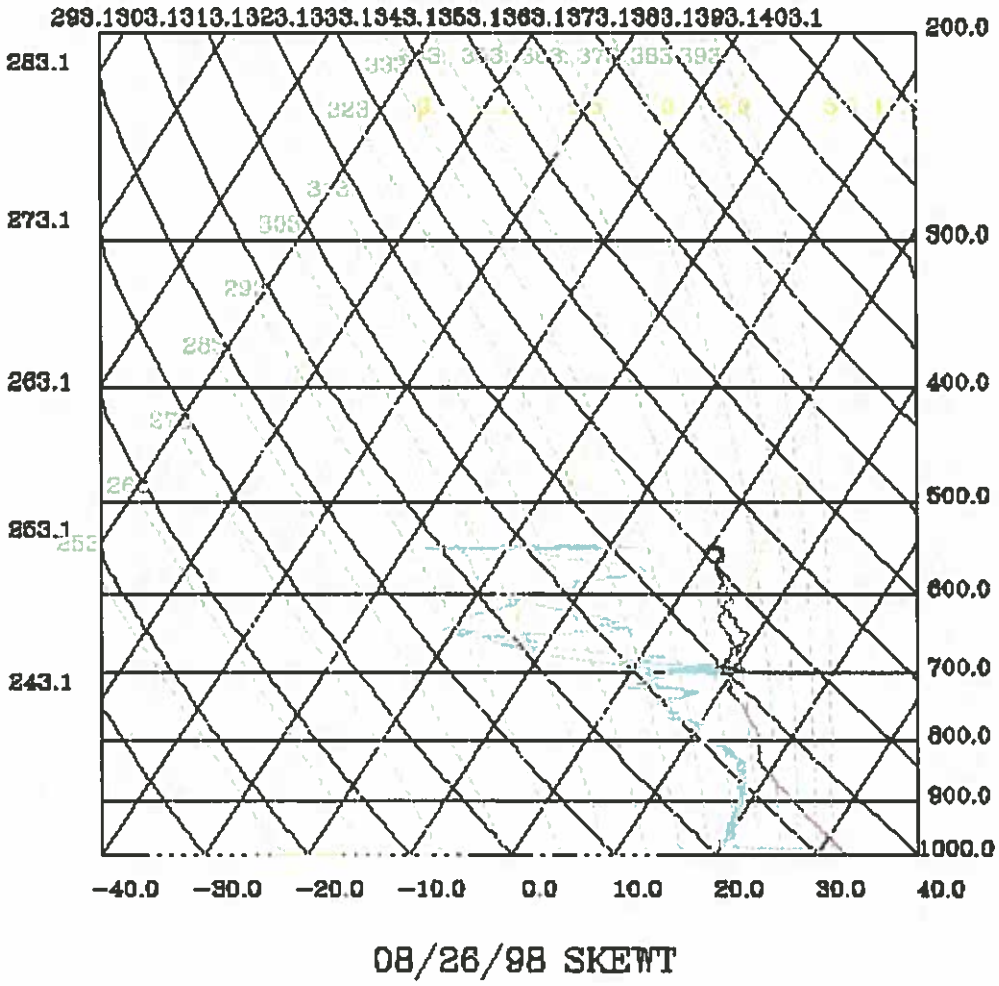
(M)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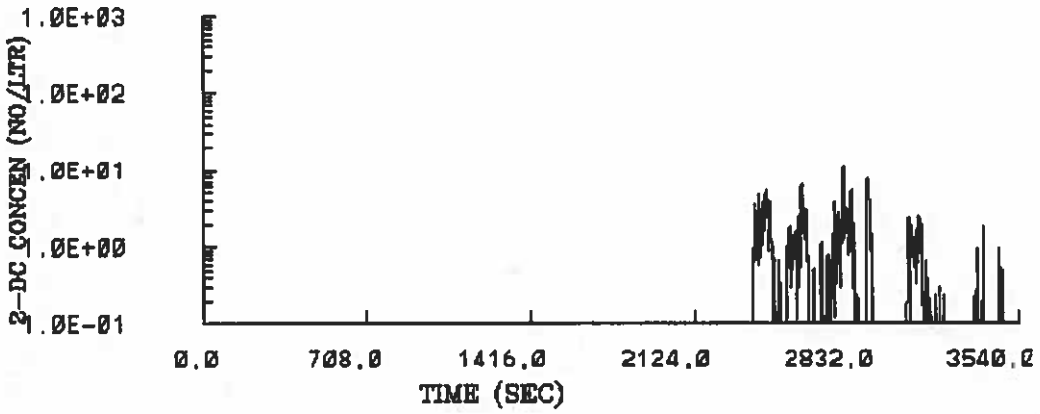
08/26/98 SKEWT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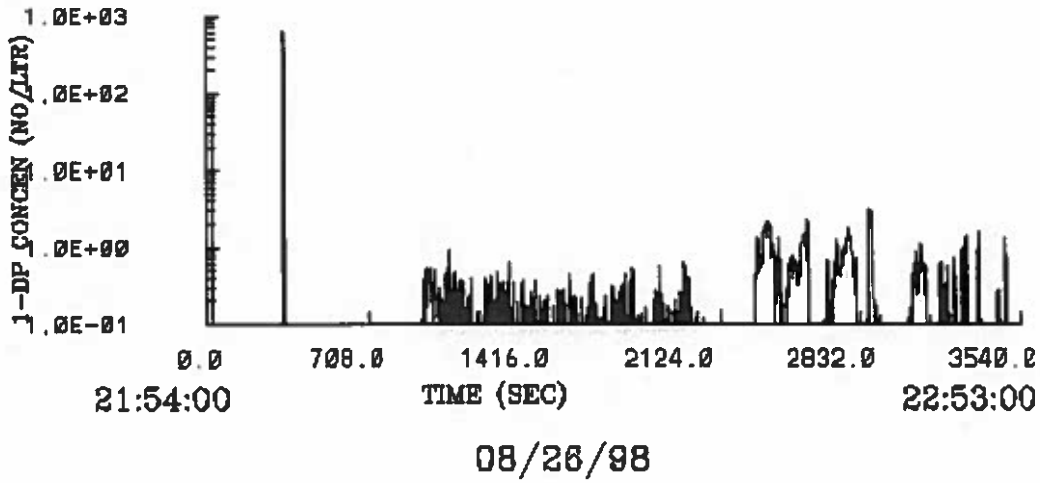
TIME (SEC)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TIME (SEC)
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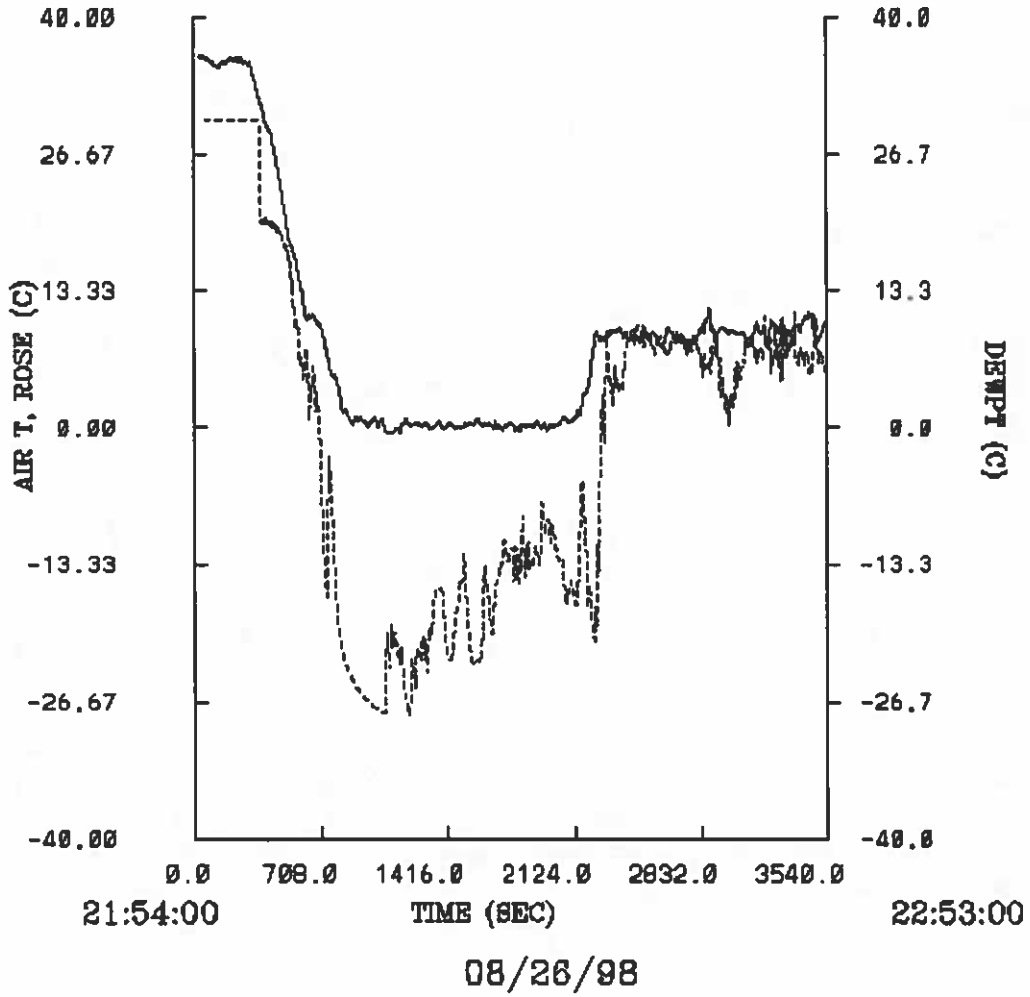
08/26/98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TIME (SEC)
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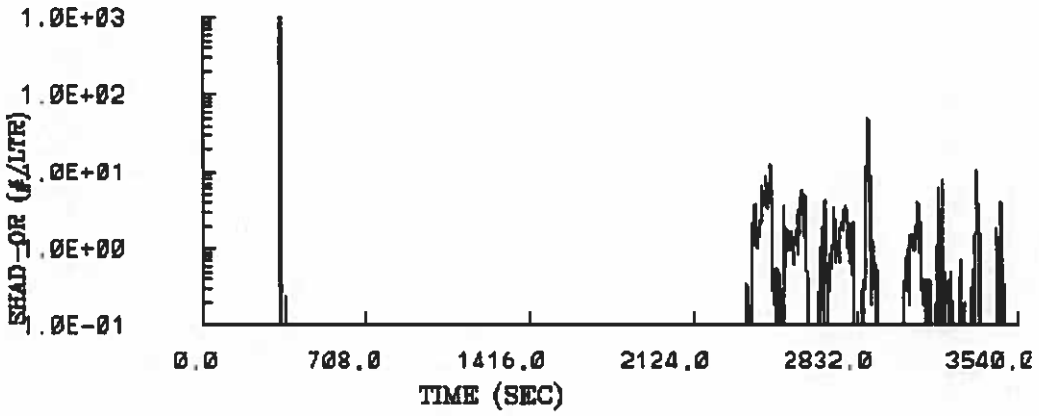
08/26/98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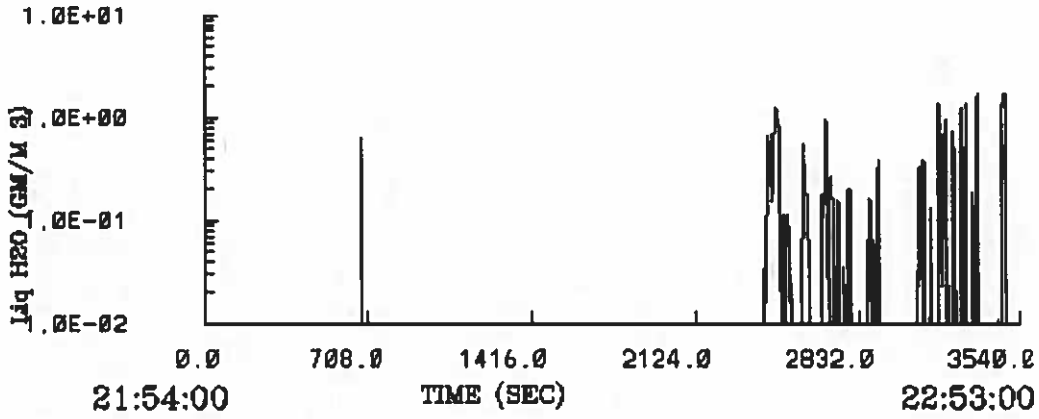
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TIME (SEC)
22:53:00
08/26/98

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

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UND Citation Flight Summary

Date/Flight Number
27 August 1998

Period of Flight/Total Time
2200 - 2315 UTC
1.2 hours

Flight Scientist
Stith

Crew
Streibel, Miller, Spears, Dye

Weather Observations
Cb/Cu south

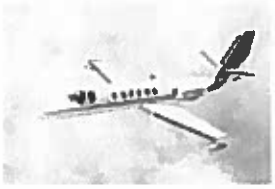
Photos Taken
Video

Purpose of Flight
TRMM/ test of HVPS. Coordinated measurements with S-Pol (~100 km away, however)

Malfunctions and Data Quality Observations
Start flight CPI time 2 sec behind SEA. CPI not recording last part.

Observations and Flight Description
A good test of the HVPS – sampled an isolated Cb from 11,000' to 20,000' through melting level and ice crystals above – cloud collapsed and we finished. Nice structure of melting band study. Probes (HVPS and others) seemed to work well.

TRMM / TEFLUN-B



Flight Summary

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UND Citation Flight Scientist Notes

Date/Flight Number
27 August 1998

21:58 Holding for takeoff
22:16 Heading toward Lake Okeechobee
22:24 About to start run at 11,000 ft
22:27 HVPS working but seems to have streaker problem
22:35 Finish pass at 11,000 climb to 14,000 cloud decaying
22:38 Pass near melting level 16,000 ft
22:40 Climbing to 20,000 after 18,000 nice needles
22:50 Good profile cloud collapsed - return to base
23:07 FSSP sees haze layer well
23:15 Land

TRMM / TEFLUN-B

Flight Summary
Flight Scientist Notes

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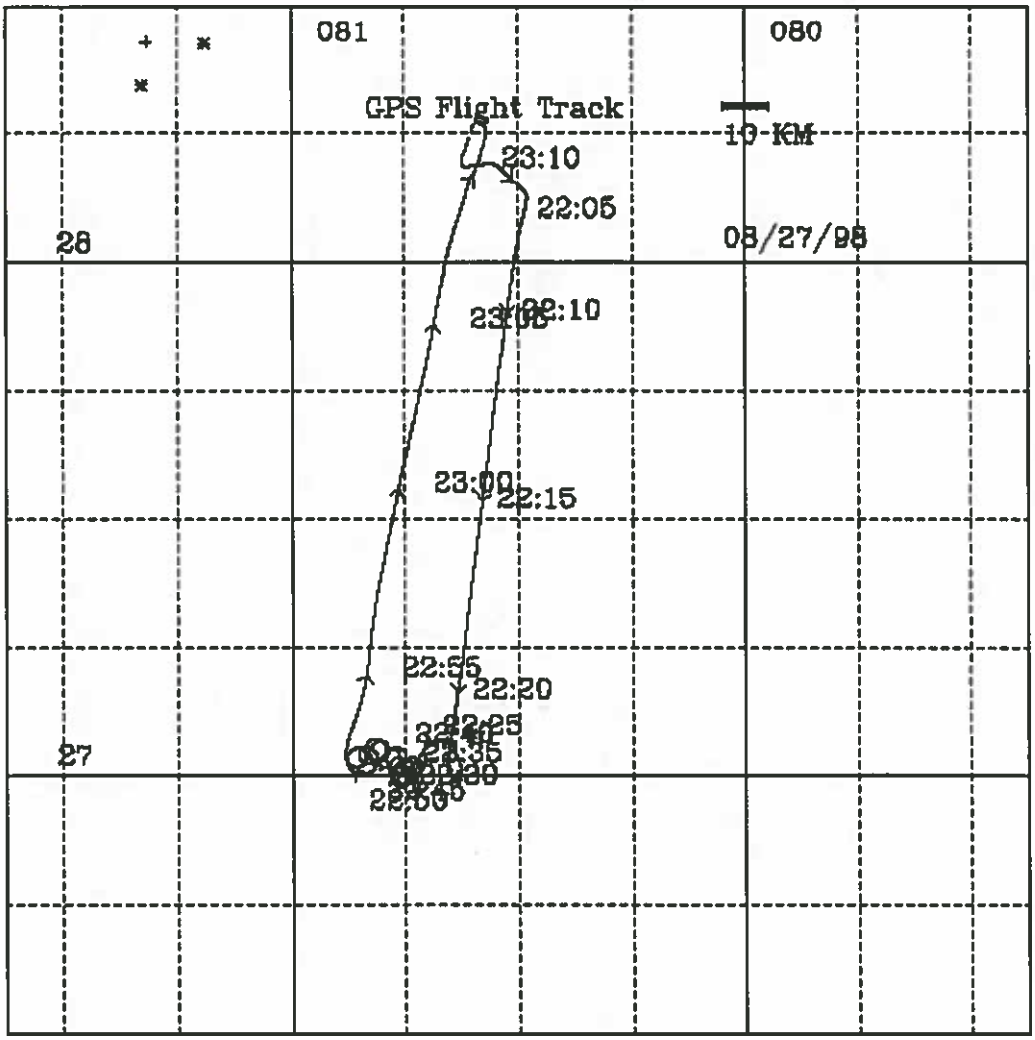
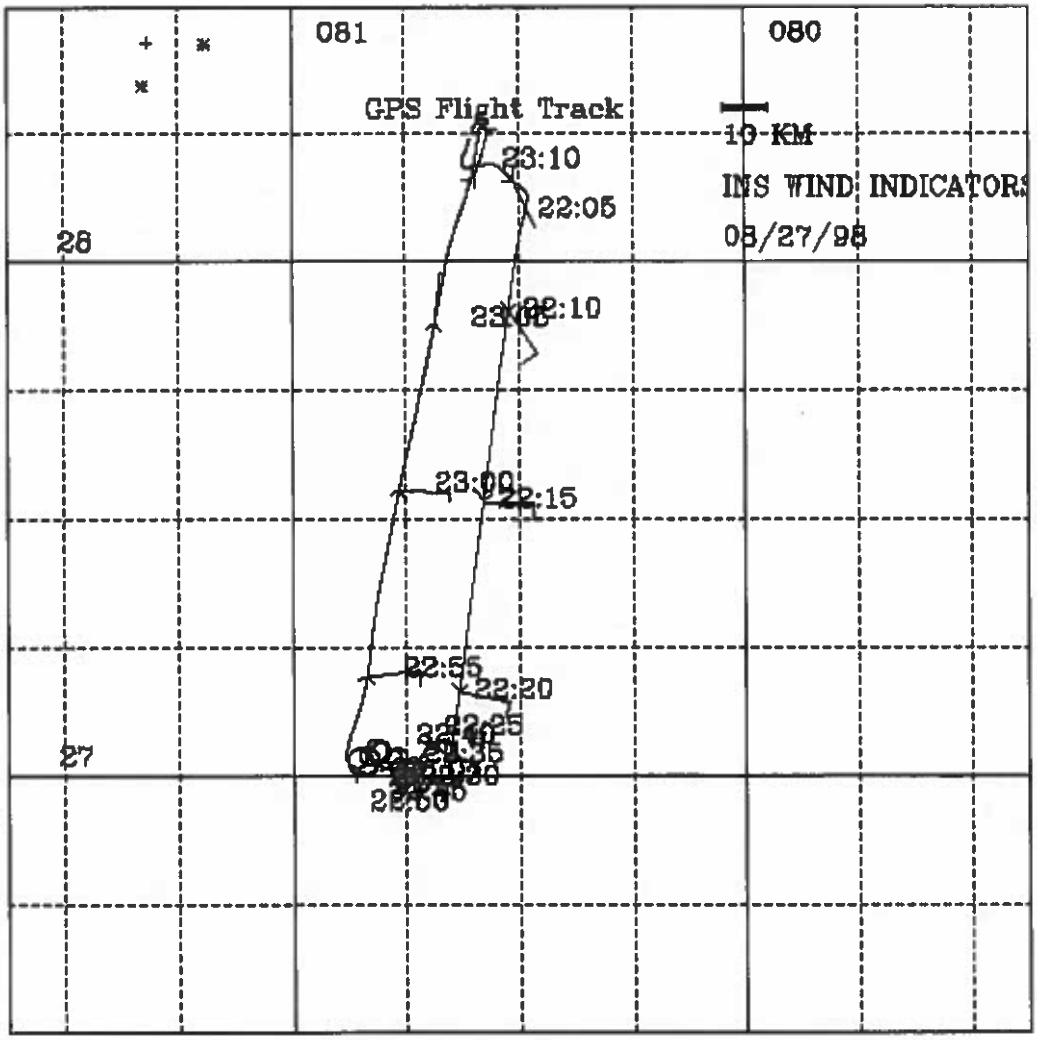
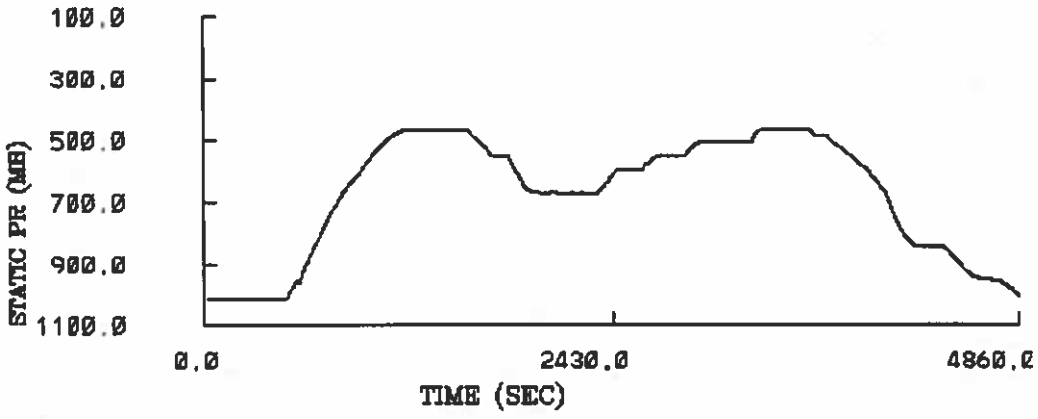
27 August 1998 Quicklook Data




081
080
GPS Flight Track
10 KM
INS WIND INDICATORS
08/27/98
26
27
23:10
22:05
22:10
23:00
22:15
22:55
22:20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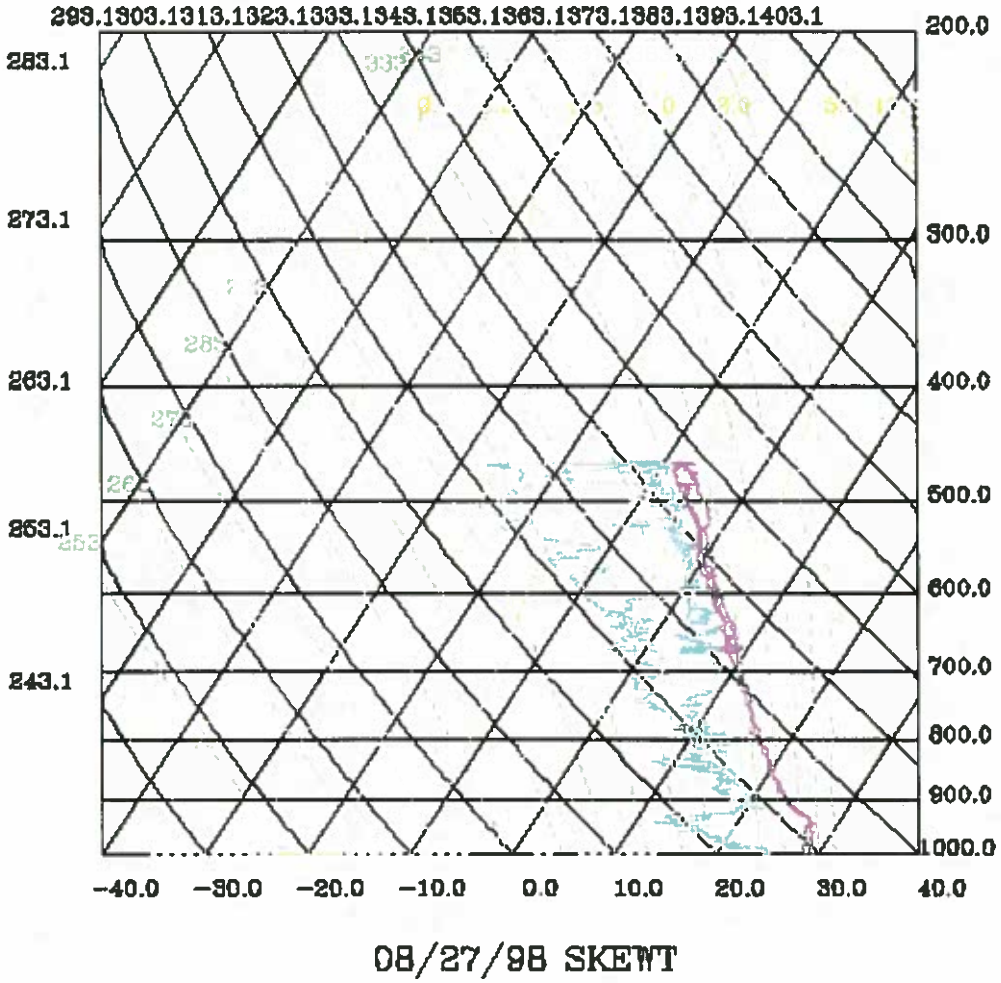
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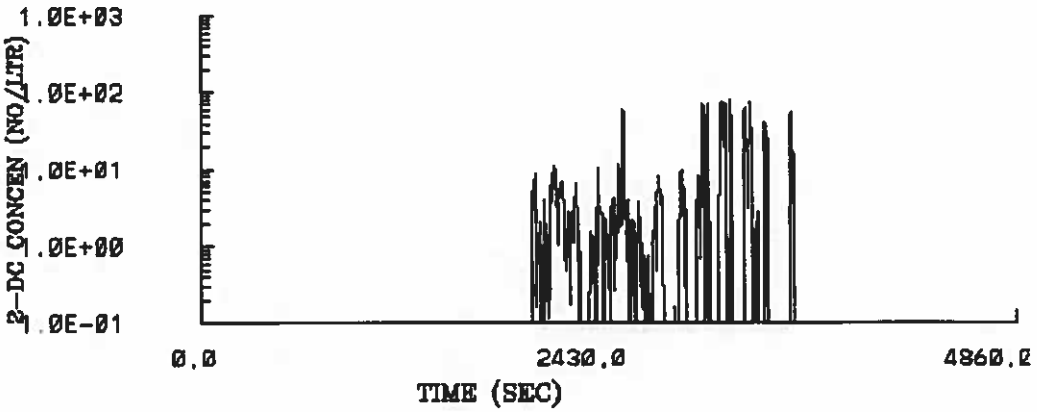
08/27/98 SKEWT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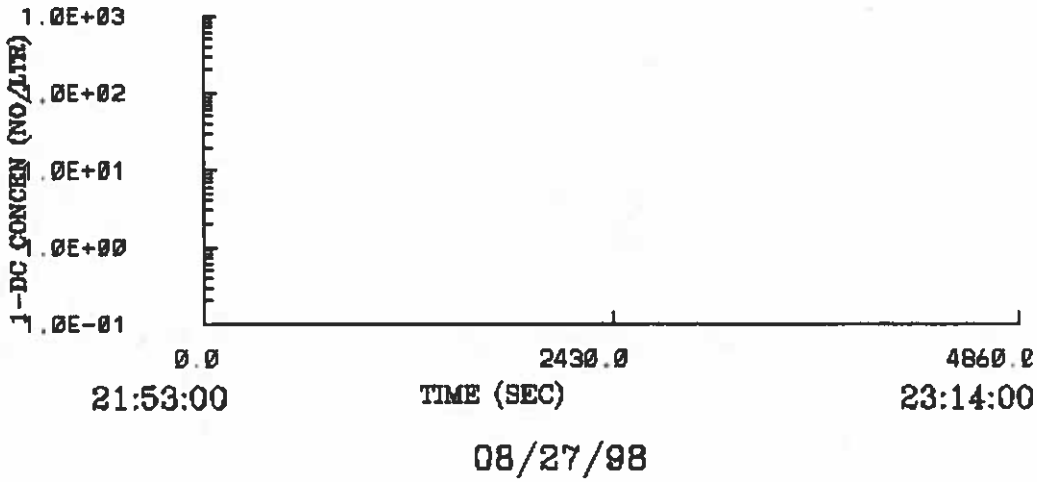
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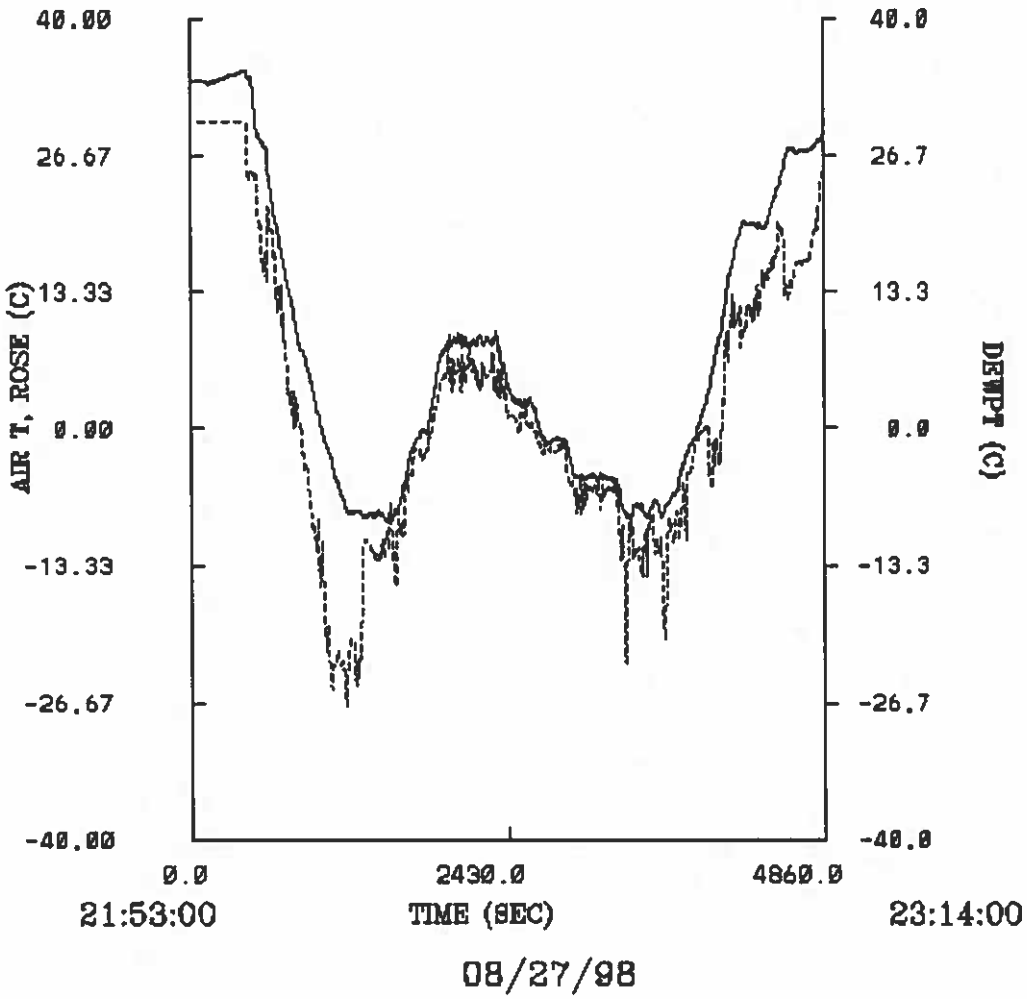
08/27/98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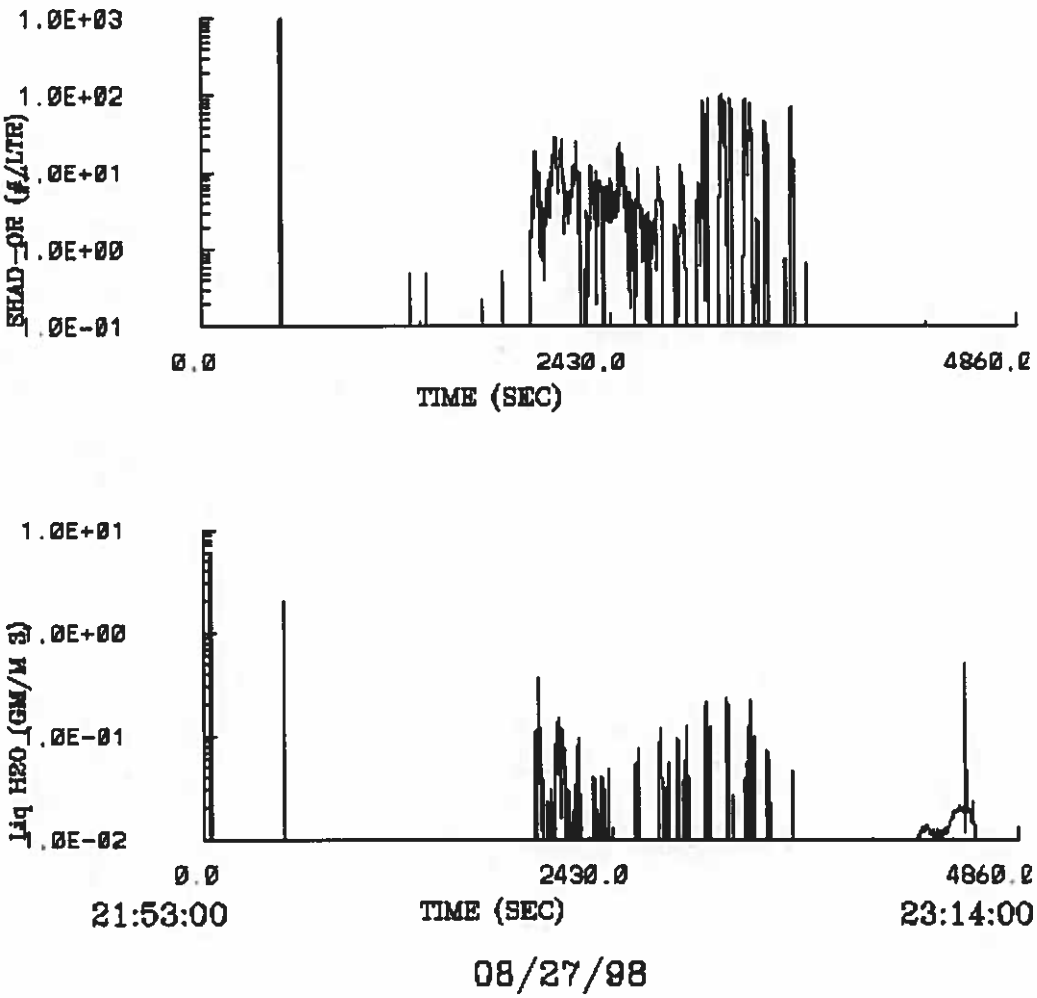
08/27/98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4860.0
21:53:00
TIME (SEC)
23:14:00
08/27/98

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

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UND Citation Flight Summary

Date/Flight Number
29 August 1998

Period of Flight/Total Time
1335-1646
3.2 hours

Flight Scientist
Stith

Crew
Streibel, Miller, Dye

Weather Observations
Small Cu along shore visible from S-Pol some Ci encountered during 29,000 foot passes

Photos Taken
Video

Purpose of Flight
TRMM overflight at 1420Z
Wind calibration maneuvers

Malfunctions and Data Quality Observations
Good - 29,000 foot reverse tracks may be affected by cloud feature and were ~30 deg. off of wind axis. Probes were off for parts of wind maneuvers. S-Pol was sampling cloud features - too small except for test of low dBZ detection limit, perhaps. CPI time 2 sec slow versus SEA.

Observations and Flight Description
1) Did high speed - low speed constant altitude maneuvers (18,000 ft)
2) Pitch up / down (18,000 ft)
3) Sideslip level (18,000 ft)
4) Sideslip banked (18,000 ft)
5) Sampled small Cu during TRMM overflight: near tops at 6,000 ft, middle 4,000 ft, base 3,000ft
   Had -5 to +5 dBZ from S-Pol
6) Box maneuver (18,000 ft)
7) Reverse tracks (18,000 ft, 130, 160, 190 kts

TRMM / TEFLUN-B

Flight Summary

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UND Citation Flight Scientist Notes

Date/Flight Number
29 August 1998

13:33 Takeoff
13:41 Probes off - no clouds
13:47 Start slow to fast acceleration
13:48:40 Fast to slow
13:50 Slow to fast
13:52 Fast to slow
13:57 Porpoise maneuver
14:00 Rudder skew - wings level
14:03:20 Bank turn and skid (right wing low)
14:06 Left turn (left wing low)
14:10 Probes on - will sample small Cu that hug shoreline during overpass
14:21 Start pass through small Cu - 4,000 ft
14:29 Repeat pass 3,000 ft
14:37 Descend to cloud base
14:39 Finish cloud base run
14:48:41 Start box maneuver
14:51:41 Turn right
14:55:41 Turn right
14:58:30 Probes off
14:58:41 Turn right
15:03:40 Turn right
15:06:51 Turn right
15:14:40 Start reverse track 160 kts 270 deg
15:20:43 Start reverse track 160 kts 090 deg
15:26:45 Start reverse track 190 kts 270 deg
15:33:10 Start reverse track 190 kts 090 deg
15:40:10 Start reverse track 125-130 kts 270 deg
15:46:06 Start reverse track 125-130 kts 090 deg
15:48:15 End reverse trracks
15:55 Reverse tracks at 29,000 ft - probes on (some Ci arround)
16:00:00 125 kts 090 deg
16:04:48 125 kts 270 deg
16:13:20 190 kts 090 deg (wind is 125 deg at 15 m/s)
15:21:30 190 kts 270 deg (wind is 134 deg at 14 m/s)
16:23:15 End mission - return to base

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

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Instrument Status
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UND Citation Flight Summary

Date/Flight Number
2 September 1998, #1

Period of Flight/Total Time
1844-2130 Z
2.8 hours

Flight Scientist
Poellot

Crew
Streibel, Miller, Dye

Weather Observations
Hurricane Earl over Gulf of Mexico

Photos Taken
Video, Photographs of relatively clear area between bands, three of on-board radar

Purpose of Flight
TRMM microphysics - Coordinated with ER-2, DC-8

Malfunctions and Data Quality Observations
HVPS seemed inoperative - persistant bars, no images or noise
CPI not recording for part of flight
M200 time set +1 minute

Observations and Flight Description
Went out over Gulf - did spiral up at line 1 midpoint 12,000 to 20,000 ft. Then did leg at 20,000 to north, then back to midpoint at 16,000. Moved to line 2, which was mostly clear. Penetrated convection at 3 levels on N end point. 400 micrometer drops at -5 deg C. Light-moderate, occasional severe turbulence. Too intense to work, so went to Tallahassee for fuel.

TRMM / TEFLUN-B

Flight Summary

Quicklook Data

Flight Log
Instrument Status
Home

UND Citation Flight Scientist Notes

Date/Flight Number
2 September 1998, #1

18:35 Taxi
18:44:16 Takeoff
18:51:30 15800 ft -4.5 C In cloud leveling at 16000
18:53:30 Cycling HVPS, columns and aggregates on 2DC
18:58:43 16000 ft -2 C
19:06:11 16000 ft HVPS cycled-shows vertical bars no particles, 0 concentration
19:08:30 16000 ft -2.1 C Out of cloud
19:11:25 16000 ft -2 C Turning north on line
19:15:15 16000 ft In liquid cloud up to 0.2 g/kg
19:17:15 columns now to 800 microns
19:21:00 2DC showing aggregates - several mm
19:22:00 Descending to 12000 ft will do spiral up at midpoint
19:23:00 14000 ft +1 C Rain, base of cloud at 13000
19:24:00 12200 ft Starting spiral at 1000 ft/min. CPI computer locked up - will reboot.
19:29:45 17500 ft -4.4 C Mostly columns, some aggregates at -5, fewer columns (wider & shorter), and plates.
19:32:45 20000 ft -8.5 C Done with spiral heading north, aggregates
19:43:30 16000 ft -1.3 C Line mid point DC-8 ER-2 moved west
19:50:30 16000 ft -3 C King LWC to 1 g/m^3
19:51:50 16000 ft -2.4 C Back in aggregates - large
19:56:20 Climbing for more efficient fuel burn
19:58:00 2D conc >150/l
19:59:45 Losing pitot nose a little
20:00:15 Switched to pitot nose/wing
20:01:41 20000 ft -8 C high conc. possible plugging of attack
20:08:20 Out of cloud. P3 has 13-15k, will go to 24k, 20k, 16k
20:12:00 Climbing to 24000 ft
20:16:35 24000 ft -13.5 C Out of cloud on line 10 N of center point. Pitot, attack good.
20:24:40 24000 ft DC-8 dropped sonde, so will reverse had just gotten into cloud
20:39:30 24000 ft -13.2 C In cloud
20:41:30 Light-moderate turbulence near northern point
20:42:25 Moderate turbulence. Picked up some ice - severe turbulence
20:52:00 17900 ft -5 C 400 micron drops on CPI
20:54:00 16000 ft -0.5 C Brief penetration
20:56:05 16000 ft Rain, some level 4 cells
21:00:00 Return to base - Tallahassee
21:09:47 23000 ft -11.8 C Recycle HVPS
21:14:10 5650 m -5 C Moderate turbulence pitot nose deviating wind 31 m/s
21:30:14 Land

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

Flight Log
Instrument Status
Home

UND Citation Flight Summary

Date/Flight Number
2 September 1998, #2

Period of Flight/Total Time
2228-0046 Z
2.3 hours

Flight Scientist
Poellot

Crew
Streibel, Miller, Dye

Weather Observations
Rain at takeoff, hurricane warning out

Photos Taken
none

Purpose of Flight
Return to Patrick
S-Pol flight

Malfunctions and Data Quality Observations
HVPS out

Observations and Flight Description
Ferry (1st part of flight) had nice crystals - good for comparing CPI with 2D-C. Flew on back (west side of decaying thunderstorm, occasional lightning. Flew legs at 26K (-18 C), 22K (-10 C), 16K (-1 C), 15K (0 C), 11K. Good S-Pol case!

TRMM / TEFLUN-B

Flight Summary

Quicklook Data

Flight Log
Instrument Status
Home

UND Citation Flight Scientist Notes

Date/Flight Number
2 September 1998, #2

22:28:00 Takeoff
22:51:50 HVPS noise
23:14:18 20,000 ft -18.5 C 50 dBZ well below 0 C 30-35 dBZ at 8 km. HVPS has black bar down the center.
23:20:20 26,000 ft -19 C Out of cloud, overcast above, broken far below
23:25:30 Plates
23:30:30 26,000 ft -18.8 C In cloud 3.5 north of northern point
23:37:00 26,000 ft -18.1 C Correcting southeast
23:41:00 26,000 ft Northbound
23:42:00 In cloud
23:44:15 Out. Has light-moderate turbulence
23:44:50 Turning around
23:47:00 22,200 ft In cloud
23:51:50 22,000 ft -10.4 C Waiting for clearance
23:52:00 King probe on
23:53:20 Descending to 20,000 ft
23:55:30 -7.3 C Columns, aggregate columns
23:58:15 Looks like two cells this trip - level 2 at north end.
23:59:25 Extended north turning
00:02:48 16,000 ft -1 C Rain
00:10:25 N band requested 14,000 descending at 00:11:00
00:18:08 HVPS white
00:20:35 11,200 ft Rain
00:31:00 11,000 N band last leg
00:36:20 1920 m 15 C Rain - up to 5mm drops
00:46:13 Land

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

Flight Log
Instrument Status
Home

UND Citation Flight Summary

Date/Flight Number
5 September 1998

Period of Flight/Total Time
1911 - 2201 UTC
2.8 hours

Flight Scientist
Poellot

Crew
Streibel, Miller, Dye

Weather Observations
Convective bands SW-NE orientation - one to south one to north

Photos Taken
Video, on board radar

Purpose of Flight
Coordinated TEFLUN-B dissipating stratiform system. DC-8, ER-2 stacked overhead.

Malfunctions and Data Quality Observations
HVPS down for much of flight. Worked when reset at T<-5C
CPI down for much of flight, worked at temps colder than 0C to -5C
M200 time = UTC-22 sec (22 seconds slow)
CPI, video times set = M200 time.

Observations and Flight Description
Started with three penetrations of convective towers. Then worked two lines in stratiform precipitation at +5, +1, -2, and -5 deg C. Followed with three spirals. Good mission with DC-8, ER-2 in S-Pol coverage.

TRMM / TEFLUN-B

Flight Summary
Flight Scientist Notes

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Instrument Status
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UND Citation Flight Scientist Notes

Date/Flight Number
5 September 1998

19:11:37 28.6 C Takeoff. Noise on 1DP ch 2-4
19:22:30 16,000 ft -1.5 C Link up on turn under anvil
19:25:15 16,000 ft Second turn a little west of first. HVPS data, but line at left. Will climb to 18,000. King LWC reading beyond edge of cloud.
19:33:10 18,000 ft -3.9 C Lining up on level 2 cloud Streak/line back in HVPS going down to south point on line 1.
19:38:54 In cloud - aggregates.
19:41:15 Some p-static
19:44:02 18,000 ft -5 C mm + aggregates, nothing on HVPS
19:49:00 In convection. Had good HVPS images 16,000 next
19:53:10 16,000 ft -2 C Back in cloud southbound. CPI just showing small.
19:55:55 Will shut down CPI after this leg and reboot.
19:58:30 16,000 ft -1.5 C Stratiform region, aggregates. Nine miles to southern point. HVPS line now on right side of display.
20:01:38 16,000 ft -1.5 C South end, turn and descend.
20:02:18 15,200 ft p-static on 2D
20:03:15 14,000 0.8 C Still p-static, aggregates and drops, south point, heading north.
20:08:30 Stray cell SE of current north point. Big aggregates in HVPS. Will descend to 12,000ft and stay on line 1. (Other aircraft switching to line 2)
20:17:55 12,000 ft 4.8 C Southbound on line, will be in cloud soon.
20:22:40 12,000 ft In rain, nothing on HVPS - noe wide fuzzy bands.
20:26:30 12,000 ft Rain. CPI may be fogged up.
20:28:40 HVPS back working - going to line 3 (never worked line 2)
20:34:00 Going to south end of line 3 - no HVPS now
20:35:18 12,000 ft On line 3 turning north.
20:41:00 12,000 ft Photos (2) of radar - level 4 cloud SPOL says no hail. 1DP not showing largest drops?
20:45:25 12,000 ft North point.
20:47:33 14,000 ft 1 C On line turning south.
20:48:30 Cycling HVPS - getting good images now.
20:49:40 Cycle HVPS again
20:53:25 14,000 ft Now mixed phase.
20:53:50 Cycle HVPS. Good images (no bar) for about 40 sec. Particles appear mostly in upper half of buffer.
20:55:26 14,000 ft 1 C In aggregates mostly.
20:56:41 HVPS images just went away.
21:01:00 14,000 ft South end - SPOL requests spiral up at 28 deg N 80 deg 20' W.
21:03:50 16,000 ft -2.5 C On line northbound.
21:10:58 16,000 ft -2 C In columns and aggregates. Heading to midpoint for spirals.
21:11:47 16,000 ft Start spiral. CPI back. Will go down to 12k then up to 26k.
21:13:30 P-static 2D, recycle HVPS
21:15:45 Nothing on HVPS
21:18:10 Now in ice crystals, recycling HVPS. Climbing now at slower rate.
21:20:30 16,000 ft -2 C In aggregates, broad 1DP spectrum. HVPS and CPI up.

21:27:53 21,200 ft Light turbulence.
21:32:00 25,200 ft -18.4 C At top of spiral, will spiral back down and return to base.
21:33:05 Top of spiral, going down.
21:36:45 22,200 ft -12.2 C P-static 2D (brief)
21:39:37 19,900 ft -8 C P-static (20 sec) pitot nose had plugged for 2.5 min
21:41:12 Switched to pitot wing. HVPS out. Pitot nose is low.
21:43:54 16,600 ft -2 C P-static - dot artifact in center of 2DC
21:45:30 0 C Still 2D artifacts, more p-static
21:47:30 13,600 ft 2.7 C Cycled 2D probe.
21:49:45 12,100 ft 5.5 C 2D artifact gone.
21:50:25 12,000 ft 6.6 C Returning to base.
21:56:00 Light rain.
22:01:37 Land

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

Flight Log
Instrument Status
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UND Citation Flight Summary

Date/Flight Number
8 September 1998

Period of Flight/Total Time
1929-2159 UTC
2.5 hours

Flight Scientist
Poellot

Crew
Streibel, Miller, Dye

Weather Observations
Broken clouds, multiple layers

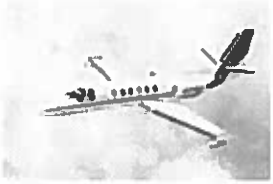
Photos Taken
Video

Purpose of Flight
Coordinated convective penetration with ER-2 overflight.

Malfunctions and Data Quality Observations
HVPS intermittent
2D-C questionable after lightning strike.

Observations and Flight Description
Flew N-S line (west coast sea breeze). One stronger cell at midpoint of line with graupel, strong up and downdrafts. Took lightning hit off to edge of cell as it was decaying. Flew four legs at 22,000, 26,000, 22,000, and 16,000 ft. (-20, -12, and -2C)

TRMM / TEFLUN-B



Flight Scientist Notes
Quicklook Data

Flight Log
Instrument Status
Home

UND Citation Flight Summary

Date/Flight Number
10 September 1998

Period of Flight/Total Time
2315-0008 UTC
0.8 hours

Flight Scientist
Poellot

Crew
Streibel, Miller, Dye, Weaver

Weather Observations
TRW to southwest toward Ft. Meyers

Photos Taken
Video

Purpose of Flight
HVPS test

Malfunctions and Data Quality Observations
2D-C gave artifacts at first, then cleared up.
HVPS worked most of the time.
King probe out.

Observations and Flight Description
Flew to area of precip to test HVPS. Started sampling in cloud at -10 C, descended to +4 C, where aggregates had melted into rain. HVPS worked better, but still locked up. 2D-C started in cloud with mixture of good images and artifacts, but it cleared up after a short bit.

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

Flight Log
Instrument Status
Home

UND Citation Flight Summary

Date/Flight Number
13 September 1998

Period of Flight/Total Time
2202 - 2140 UTC
1.3 hours

Flight Scientist
Poellot

Crew
Streibel, Miller, Heymsfield

Weather Observations
Few Cu

Photos Taken
Video

Purpose of Flight
Intercomparison with DC-8

Malfunctions and Data Quality Observations
All good.

Observations and Flight Description
Flew roughly same path as DC-8, although probably 0.5 to 1 mile apart.

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

Flight Log
Instrument Status
Home

UND Citation Flight Summary

Date/Flight Number
14 September 1998, #2

Period of Flight/Total Time
2032 - 2337 UTC
3.1 hours

Flight Scientist
Poellot

Crew
Streibel, Miller, Heymsfield

Weather Observations
Cb NE, SE-S

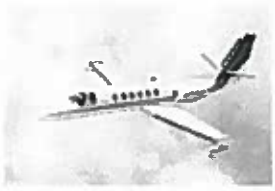
Photos Taken
Video, photos of convection, rainbow.

Purpose of Flight
Coordinated mission with DC-8

Malfunctions and Data Quality Observations
Pitot nose plugged for a short while.
Good data.

Observations and Flight Description
1. Flew 2 lines (-5, -2 C), 2 spirals (to +6.5 C) in stratiform precipitation.
2. Did three passes through tower (-1,-7,-10 C).
3. Did spiral back in stratiform (very light) precipitation from -10 to +5 C
4. Penetrated a series of six towers, mostly at -6 to -10 C finishing with two passes at +5 C

TRMM / TEFLUN-B



Flight Scientist Notes
Quicklook Data

Flight Log
Instrument Status
Home

UND Citation Flight Summary

Date/Flight Number
14 September 1998, #1

Period of Flight/Total Time
1434 - 1621 UTC
1.8 hours

Flight Scientist
Poellot

Crew
Streibel, Miller, Heymsfield

Weather Observations
Rain

Photos Taken
Photos of convective regime.

Purpose of Flight
S-Pol mission

Malfunctions and Data Quality Observations
No video tape.

Observations and Flight Description
Did several penetrations of convective tower from -5 to -13 C. Then descended and sampled rain at two levels. (+5, +7 C). Followed this with spiral up in rain through melting to -5 C. Spiraled back down, cell dissipating, in light rain, down to +14 C. Good convection mission over water. All probes worked (good HVPS and CPI data).

TRMM / TEFLUN-B

Flight Scientist Notes
Quicklook Data

Flight Log
Instrument Status
Home

UND Citation Flight Summary

Date/Flight Number
15 September 1998, #1

Period of Flight/Total Time
1609-1739 UTC
1.5 hours

Flight Scientist
Poellot

Crew
Streibel, Miller, Heymsfield

Weather Observations
TCu

Photos Taken
Video

Purpose of Flight
S-Pol mission on new convection

Malfunctions and Data Quality Observations
None

Observations and Flight Description
Worked a small convective complex near S-Pol, over profiler network. Worked two towers (1,2) at -0.4C, -8.2C. These merged (3); continued working (3) at -5C then +1C. Could go no lower because of air traffic. Worked final tower (4) at +2C, -2C.