Photo courtesy of Dave Moore; King's College, London

University of Wyoming
CLDGPS 2008

Measurement of Cloud Perturbation Pressures using Differential GPS

May 16 2008 - June 15 2008

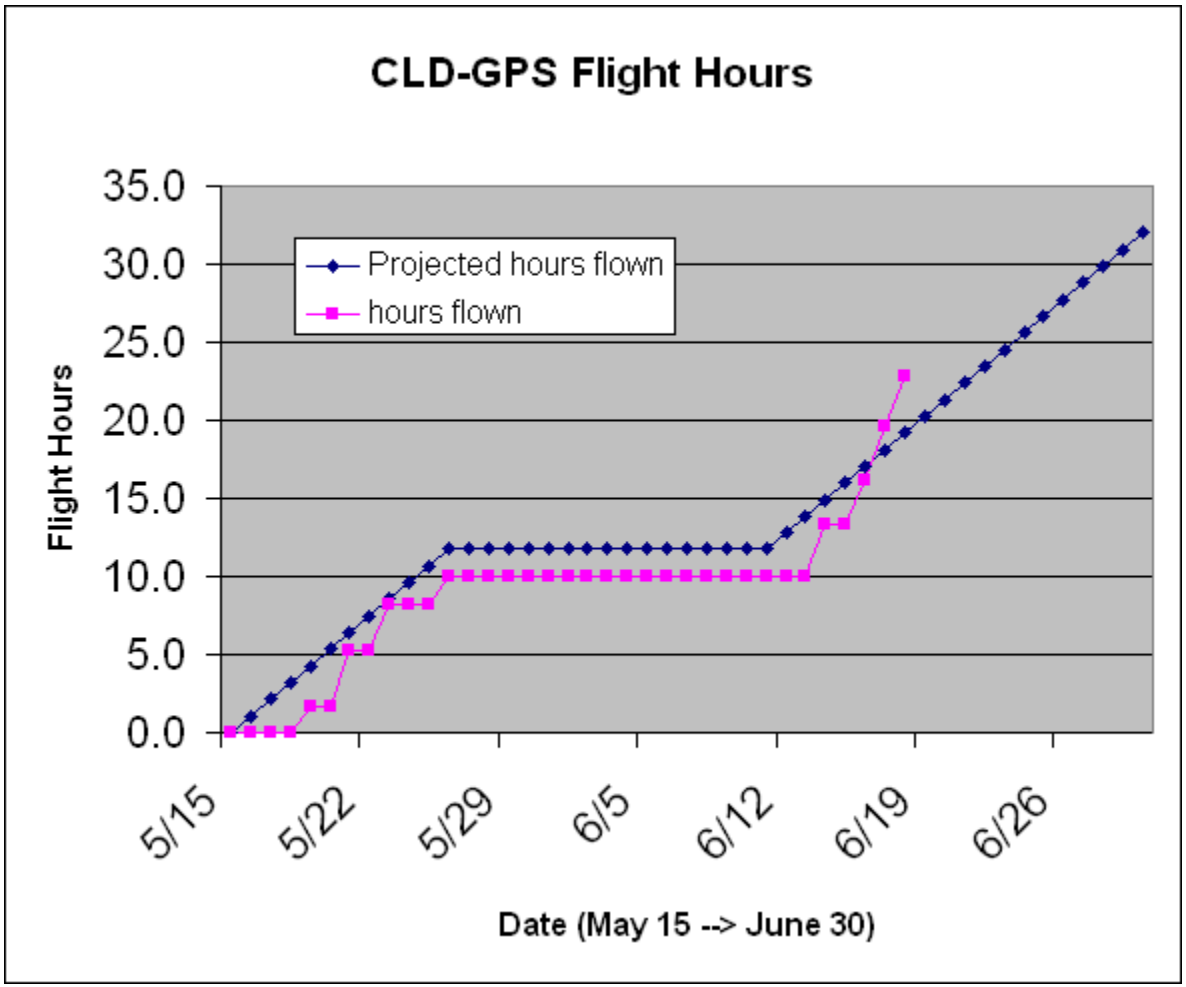
- Contacts
- KingAir (UWKA) Data
- Radar (WCR) Data
- Lidar (WCL) Data
- Plot of Flight Hours

UWKA Deployment Status Calendar (KAOS), psswd'd

UWKA Web Page

Date	Flight # (*.kml)	Status	Times (UTC)	Hours	Crew/Notes
Research Flights					
24 Jun	RF11	Fourth seat computer quit mid-flight and restarted later. FSSP data questionable.	1647 - 2044	4.1	T Drew J Vogt L Oolman
23 Jun	RF10	Fourth seat computer quit mid-flight, no WCL data after this point. FSSP data questionable.	1455 - 1903	4.2	T Drew J Vogt L Oolman
19 Jun	RF09	FSSP data questionable.	1753 - 2008	2.3	T Drew T Parish L Oolman
18			1924 -		T Drew

Jun	RF08	FSSP data questionable.	2233	3.3	T Parish L Oolman
17 Jun	RF07	FSSP data questionable.	1826 - 2147	3.4	T Drew T Parish L Oolman
16 Jun	RF06	IRIG cable incorrect to WCR. No time in files. FSSP data questionable.	1759 - 2048	2.9	T Drew T Parish L Oolman
14 Jun - B	RF05	Clear air flight to calibrate pressure corrections. No WCR data. Note: use 20080614**b** files.	1743 - 2037	3.0	T Drew T Parish L Oolman
14 Jun - A	RF05	Returned to base - HADS pressure not working	1656 - 1705	0.3	T Drew T Parish L Oolman
N2UW down due to maintenance following a lightning strike; 27 May -- 11 June					
26 May	RF04	Worked growing line (oriented N/S) on northwest side of Rawlins. Ended flight early due to lightning strike at ~2005; following strike no data from FSSP and 2DC. DMT probe had a failure of slave (and main?) coil ~20:05, unrelated to lightning. Following flight N2UW down for extended period for maintenance to engine and prop.	1910 - 2051	1.8	T Drew T Parish J French
23 May	RF03	Tried to target growing Cu on east side of Laramie Range. Clouds difficult to work, ended up flying across a line north of Medicine Bow, reasonable updrafts. Tried some penetrations to "float" in order to minimize pitch variation. Flew exclusively VFR. No know instrument problems.	1804 - 2053	2.9	T Drew T Parish J French
21 May	RF02	Flew beneath bases of growing cumulus and cells that were feeding into rather large storms along Laramie Range to the north. TwoDP had problems intermittently; EndElement voltage appeared flaky; flew exclusively VFR. No other Known Instrument Problems.	1958 - 2329	3.7	T Drew T Parish J French
19 May	RF01	testing some flight patterns, clouds not cooperating; no isolated, growing cu, flew mostly under strato-cu deck. 2DP data messed up; no other Known Instrument Problems.	2050 - 2228	1.7	T Drew T Parish L Oolman
Test Flights					
14 May	TF01	Test Flight 1; radar relative power calibrations, Rodi maneuvers, radar beam calibrations, waves present so likely not great data for Rodi's; 2DP went into overload for ~30 minute period for no apparent reason	1714 - 1840	1.5	T Drew T Parish J French
Total Flight Hours			33.6		


CLD-GPS Flight Hours
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Flight Hours
Projected hours flown
hours flown
5/15
5/22
5/29
6/5
6/12
6/19
6/26
Date (May 15 --> June 30)

Flight and Debrief Notes
JF

Project: CLDGPS08
Flight: RF04
File: 20080526a

Crew:

T. Drew
T. Parish (PI)
J. French

Preflight:
Plan is to target growing cumulus clouds that are forming in triangle defined by Rawlins, Rock Springs, and Riverton. Most areas east of this triangle are socked in with low clouds.

1902Z obs: T ~ 7c, Tdp ~ 6c, lght rain, winds 130 / 18 gusting 25, 300-700 ft ceiling

This will be the first flight of CLD-GPS that is done in IFR conditions, we will not be able to get under clouds very easy and we need an IFR clearance to get to the ops area (because of low stratus clouds).

We delayed roughly 1 hour before takeoff in hopes that conditions would improve for isolated clouds.

Flight:
Wheels up 1910

1918 above clouds, everything is running and looks OK. Enroute to point west of Rawlins, FL160.

1921 severe clear above us, WCL parallel power looks odd to me, possibly ice or fog on the lens? We had rain on ground prior to takeoff.

1940 begin to work cumulus clouds that are forming in what appear to be n-s line, drop to FL145 for penetrations.

1948 2nd pass through cloud, not much of an updraft

1957 pass through cell, new growth on south side?? ~3 m/s updraft

2004 pass through cell, not much vertical wind.

2015 (??) strong lightning flash; appears that 2DC and FSSP not working following flash; likely were struck. Return to base.

2051 wheels down.

Post Flight:
Working in clouds for first time in project, flying through graupel shafts, this likely leading to charge on aircraft??

No lightning in the line we were working prior to flash that struck the King Air.

We worked along line, earlier flight we confined ourselves to working across the line and focus only on newest growth. Could not do that today because of other cells (well off) to the side that were larger.

FSSP and 2DC did not appear to work following the flash.

Prior to flash, baseline for DMT jumped, turns out the slave coil was busted in mid-flight, not a result of the lightning.

Flight and Debrief Notes
JF

Project: CLDGPS08
Flight: RF03
File: 20080523a

Crew:

T. Drew
T. Parish (PI)
J. French

Preflight:
Plan is to target growing cu over the Laramie Range and on the east side of the ridge, expect the growth to be rather vigorous today, lots of moisture available

Also will try to minimize pitch/alpha variations as we fly through clouds by allowing aircraft to "float" with updrafts and downdrafts.

1753 obs: growing cu to east and north, T ~ 12 C, Tdp ~ 1 C, winds 130 / 29 gusting to 39

Flight:
Wheels up 1804

1809 everything up and running, looks good.

1815 under cu cell, not much of any updraft, look to be working the west (new?) side of a line

1818 cell difficult to work and identify, turn back to south looking for more workable cells

1830 under a cell, FL090, 1-2 m/s vertical wind

1839 under new cell, 5 m/s updraft, looks to be young growth

1847 under 2nd cell, further east, 2-3 m/s updraft

1850 these cells hard to work because of lots of other clouds around them, difficult to identify individual cells and "new growth", turn around to head back towards line to west.

1854 hunting for targets

1906 targeting cell north of Wheatland, ends up being too close to restricted area

1919 give up on cells near Wheatland

1923 setup on new target cloud, 1924(??) under target??

1930 give up on this target, look for another

195145 underneath middle of new cell, 4 m/s updraft

195630 2nd pass, same cloud(?), 2 m/s updraft

200150 another pass, 4.5 m/s updraft

200630 another pass, 9 m/s updraft

2008 – 2040 continue work clouds north of Medicine Bow, across line in "new growth".

Post Flight:
Flew entirely VFR, "floating" got us into cloud…we need to watch this closer in future flights if we don't plan on holding a strict altitude during pens underneath clouds.

Clouds east of Laramie Range difficult to work because too many other clouds around to identify new growth.

Flight and Debrief Notes
JF

Project: CLDGPS08
Flight: RF02
File: 20080521a

Crew:

T. Drew
T. Parish (PI)
J. French

Preflight:
Widespread convection in valley, will try to target clouds to north, maybe around Laramie peak. Shoot for 2 PM takeoff.

1952 obs: CLR, T 22 C, Tdp -2 C, winds 130 at 18 gusting to 23

Will try cycling power on p probe to see if we can get to fail (or fix), problems noted on last flight and test flight, we have been unable to duplicate on the ground.

Flight:

1958 wheels up

2005 everything up and running, p-probe looks OK so far

2011 pass under target cloud 1, just above base at FL 152, max vertical wind ~9 m/s

2017 2nd pass under target cloud

2019 end element voltage for P probe began jumping around, data look OK.

2022 PMS L heater turned off for about 1 minute, no apparent effect on 2DP

2024 picking new target cloud

2025 PMS L breaker off for about 1 minute, after cycling power, 2DP looks screwed up??

2028 pass 1 under new cloud at FL 135, no well defined updraft

2030, 2031 cycled power and heater power to 2DP

203730 pass 2 under same cloud, again no well defined updraft

2040 looks like 2DP is working again

Moving to more vigorous convection north and west of Laramie Peak

2100 pass beneath vigorous growing cloud, vertical wind +10 m/s, -8 m/s

2111 under cloud again, all downdraft

2123 underneath feeder cell (??), very large/broad updraft, 10-12 m/s up

213330 underneath on another pass, still very broad, 10-12 m/s up

2144 under cloud, broad, well defined updraft

2201 underneath new growth, skinny, earlier cloud much bigger with lightning and magenta echoes

2215 under cloud, broad updraft 8-10 m/s up

These clouds grew into very large storm, start looking for new clouds, heading back to south
At some point lidar hung on big bump

2329 wheels down

Post Flight:
2DP flaky again

Radar data from ground useful, but painful to wait for, difficult to use for targeting

Worked exclusively VFR, large pitch deviations due to large updraft/downdraft, worked very well the leading edge of a storm in the feeder cell region, storm grew very large.