Peltier traps - please add back plate so fingers can't get in the fans.

S.Z.

1 Feb 2019 - Mostly fixed it all up!

Filename: has 1354 as time

Testing - Reset sample time to 20sec (from 60sec) so results would be FASTER

There is still some leak in system letting room air in as shown by blowing on connections.

Base value ~~439~~ (xc) 480

Running STDs: -1; 370ish, 708

Blow around • boxes parts (outsides)
~~grey~~ • top of equilibrator
• connections in "FROM SHECQ" + "TO SHECQ"

can raise value to ~518

Hard to figure out which is culprit but the area around box seems ok.

So 25/500 ~ 5% error ...

Stopped file and reset sample interval to 60 sec and restarted program @ 1446

4 July (5 July 0335 UTC)

Starting up pCO_2 system:

STDs set at 10PSI
0, 384, 1138ppm

Water coming at 0.5 ~~0.5~~ 0.5
* Flow rate not yet measured

Setup
LI 840 Com Port 3
VICI Valve Com Port 5
NI-DAQ
Serial output cable not enabled
Sample Int 2
STDs 3
1st Std Time 120 sec
Post std delay 1 min
Std duration 90 sec
Min time btw stds 240 min
No TSG
12 V I/O 1 is on

Saving File to 2019\ 20190704-Data1

Readings:
See Atm (too high)
STDs are 0, 2380, 4100 but not too stable
Sample is 400 to 500 ppm

Flow ball is pegged at top ... at least during sample measurements.

Temp is -3.8 C, should be ~15 C
Pressure is 75.4 kPa (units? Book's example shows ~20 kPa)

LICOR DATA: xc 428
CO_2 Abs 0.09
H_2O 12.42
H_2O abs 0.08
Cell Temp 51.90 C
Cell Prs 102.60
Input Voltage 24.07

Analo I/O
0.93 12V I/O 1 (FLOW meter)
@ 0814 July 4th

Atm time completely off. Need to reset. 0815 4th July = 0441 5th July UTC
(pCO2) (correct)

① Shut down software + pCO_2 box
② UTC 0507 July 5th ~~Res~~ Set time on ~~syst~~ computer clock
③ The water level in the SHEQ had been slowly rising. When system powered off the water level went back down to the blue-taped lines.
④ Unplugged and replugged temperature connector to box.
⑤ Before turning off see that breathing into SHEQ holes gives huge spike. 1100 ppm What are these holes in the side, just above the blue tape? Maybe they shld be plugged?

So water level in SHEQ was ~~this~~ rising when sample pump was on.

I could try opening the make up air?

// Turn on again: File 2019-78-data2
@ 0519

- water level jumps back up to where it was
- Temperture still is ~3.8
- Atm 550-606
  STD 1=0, 380, 1119
  STDs are much more steady this time around.
  (Flow ball pessed even during STDs sampling + when turned off!)

Covering side SHEQ barrel holes the pCO_2 drops from 500 to ~475

Opening the make up air to the lab gives ~505 ~~pCO_2~~ ppm. water level does not drop so its not a pressure thing? Breathing into it I get a good spike

COM 3 LICOR
5 Valve
NI DAQ AI Channels
Dev1/ai27
serial output 4

! 0540 - covered the SHEQ holes w/ tape. now @ ~482 ppm → 475

But breathing all over connectors still pumped it / reading up to 550 so still some leaks...

0930 - check in w/ system. Lab empty, reading ~410 ppm
typed Breath test... ① connector b/w SHEQ and Peltier gives a +15
typed ② connection to Peltier give +40
③ exit from water ~~Exp~~ one-way filter gives +20
But other connections seem ok ok only minor

0955 - Then tried to drain Peltier trap - under suction so water would not drain, just suck air in. I guess pump needs to be off to drain sample

Hmm typed those connection b.t they are still leaking...
1015 - stop for now.

5 July 2033 - Fiddling again
Unplug To SHEQ

6 July 1316 local (GMT -7)

Sample + air line dont have restrictor valves on the small lines going btw "T" and multiport valve.

I stole the restrictor valve off STD 4 (unused) and added it to the sample line and now flow is no longer >250 ml/min and has been reduced to 50 ml/min

This will reduce volume of makeup air and should help w/ the back-pressure in the SHEQ

Next Peltier A cools well but leaks at valves
Peltier B isnt cooling well. but has nice connectors ...
↑
·so the nice connectors on Peltier B removed and swapped w/ A.

Peltier A back in place w/ sample Flow

The water block filters removed.
• If they get wet will pump blow up due to ~~no~~ no flow?
• Are they making it harder for Flow to travel creating pressure @ SHEQ?

Restart software @ 2210 UTC July 6
STDs 1, 3 ΔX, 1120
Water is 385 (!) much lower than before
Atm is 500 so clearly in a contaminated spot

More changes:
Water level in SHEQ was rising so wondered if make up air was not actually available from the tube it was in.
Changed plumbing to bring make-up air from atmosphere exhaust T, though since atm line is contaminated sample value is still ~~too~~ high.

Opened "To SHEQ" restrictor flow to all the way open + then readjusted the small restrictor valve to multiport valve until flow was ~50 ml/min

So current values @ 22:19: 6 Jul

xC	380.54
CO_2Ab	0.08
H_2O	10.95
H_2Oabs	0.07
CellT	51.89
Cell P	102.58
InputV	24.04v
Temp	-3.7
Press	75.3
1 Analog V$_o$	0.96
2 "	0
3 "	0

Time Stamp (good) 22:21

~~Quick check For~~

Sample Flow @ meter
50 to 70 ml/min

Make up air from
Air exhaust T

Peltier A w/ NO
↑ water block
Filter

@ ~~the~~ quick
click
connectors

SHEQ barrels
still have
tape over
"Atm vents"

Water level in SHEQ
is at top of blue tape mark For each
barrel.

Flow is at 0.5 Gallons per min
For each bulkhead based on flow gauges

Peltier B NOT set up on Atm line.

Breath test: In box OK
outside box OK
top of SHEQs OK
Peltier A OK

Stable at 387 2233 UTC

=

STD 1 Flow restrictor valve was on backwards so this was undone + changed direction so that
& symbol matches arrows
at the

— 7 July ~~0328~~ UTC 0335 UTC

Disconnected the atmosphere line
~~and~~
Connected new line that runs out
the winch/davit ~~room~~ control room
into very fresh air

CO_2 had been ~410 (400 to 420)
As make up air from atm line getting sucked in
the sample CO_2 is dropping. Levels out at 390 ppm.

How much STD?

950
0 : ~~955 9050~~ psi set @ 10psi

384 : ~~12,000~~ 1200 psi set @ 10psi

1138: 1850 psi set @ 10psi

0345 Renew STDS! @ 0345
STD Atm 405
① no Ø? (NO FLOW)? why was valve in bucket wall?
② 384 (cool!) coming in at over 250 ml/min
③ 1122 " " " " "

check resistr values tomorrow...

Unit sample now coming in over 250 ml/
so at some point valve ① was passed. +
~~Atm may have passed sa~~ stuck

Still w/ atm line, dropping down to 381 ppm
0402 down to ~~327~~ 377 ppm @ 0402
but then needed to pull the atm line in.

1509 Took tape of the SHEQ vents. ~~xx~~
These are ~~pitot~~ "antisiphon" ports to
keep SHEQ from accidently overflowing.
Now that ~~pressure is not big pulled~~
in there is no longer so much suction

in SHEQ the vents must be actively drawing in air. I hope.
lab

1611 @ 1611 adjusted flow restrictors on all the standards so now there is flow on 0 STD again! and they are all at 100 ml/min.

2017 CheFF gave permission to run atmospheric line through main lab + ctd lab doors. We then run line out cto lab window to Rosette area, up to deck above, forward, then up to bridge level, just aft of bridge house - just outside the port door.
Plugged into box - although a run of ~50m the ~~xx~~ atmosphere exhaust Feels strong.
Atmospheric line is a) ~45 m of black stiff tube, similar diameter to the BevA-IV tubing. b) ~5 m of BevA-IV tubing and c) ends with 6" of Flexible tubing + funnel cup.
Very Few connections. Nice!

STDs had just run. so set it to run again and monitr flow.
No spikes w/ breath test.
(3)

Value:	406	3	382	~~1140~~ 1122	sample @ 398
Flow:	7250	100	100	100	50
what:	AIR	①	②	③	sample

Peltier A is Filling up fast!
At ~24 hr, is 2/3 Full
20:35 Empty @ 2035
Had to disconnect "Peltier to line to box"
so there would be to empty, otherwise
its just sucking in air bubbles through
the Peltier Knob.
↑ open
ie pump is pulling air through system
so need to disengage the pump
suction to empty the peltier.

Breath test in front of SHED Atm vents
unkpad
has NO effect! Yay!

So what is left?
- Fix Peltier B (doesn't get cold)
- See IF wiring is compromised for
pressure + temperature
though these #s do change ie ~3.8 to ~4.1
kPa 75.8 to 75.5

8 July 0930 - Must have had a leak in
the Ø STD line. It is the tank
is now empty!

1008 emptied Peltier trap.
Had been breathing on system, seemed to
vary 411→420 ... but not sure. No changes

started mucking w/ line because sample went from 390 to 420 after stds ran...

9 July 0417 - emptied Peltier trap.

1948 - after taking apart sample 'T'
water was pulled into pump (but
came out open T so no water into
Licor.
Sent some FW through pump, changed
tubing, ran pump more, still had
water, init so waited 'til morning.
Borrowed ET's "torque-stroke" wrench,
opened pump, wiped down + made sure
it was dry, reassembled and started up
@ 1948.

407 Serial OUTPUT was not enabled but
~~404~~ tried setting to COM4 and enabling.
~~326~~ 364 Not sure what this does?

Values:	CO_2	H_2O	in line Flow
Sample	390	11	50
air	407	◯	>250
STD 1	—	—	Ø
STD 2	364	7 ish	100
STD 3	1119	10.8	

and I put the water trap filter back in line.

Note there is no Peltier or water trap on
air currently. Need to add

380 STD tank is @ 1800 PSI

10 July 2019
1600 UTC -
Breath on SHEQ + trap no change
Breath on outside of box ~~35~~ 359 to 362
so slight leak here.
Breath on inside of box as well 356→364
Close back up @ 1609
Pushed all connects ~~back tape~~ in to check tightness. Did not remove any.

Peltier trap is 1/2 full emptied this, first taking off ~~the~~ "To SHEQ Box" line.
SPIKE to 2600ppm (wow!)

also sample flow was down to 40 ml/min so this was increased using flow restrictor. Hmm, increased it to 50 but now after ~~it~~ emptying the Peltier its up at 100 ml/min.

Open ~~a~~ box again and adjust flow. Hmm not needed it was just a spike I guess...
1617 stopped fiddling.

ATM / STDs:

Atm 409
STD1 X
STD2 ~~350~~ → 383
STD3 11??
} looks good;

10 July 2139 UTC
System turned off + Seawater loop turned off as we approach Dutch Harbor.

11 July 2331 UTC
Seawater loop turned on, ~~pc~~

Check STDs - tanks were turned off when system shut down yesterday.
Today 384 - still holding 10psi + 1200psi
1138 - was 0, 0 turn on and now 10psi + 1800psi

* So 1138ppm line has leak somewhere)

Seawater @ 0.5 gpm each

Removed sample water trap/filter (vacuguard - worried it creates too much suction...

~~Pow~~ Reboot tablet, power ~~box~~ licor + pumps on, ~~Settings change file~~

Sample flow @ 50 to 60 ml/min

Settings: Change File size to 240 min so there will be a set of STD for each file.

Change STD duration to 100 sec. to help stabalize STD 2 (384 ppm).

Start File @ 2352

XC: 306
CO_2 Abs 0.07
H_2O 11.15
H_2O Abs 0.07
Cell T 45.66
Cell P 101.35 kPA
Input V 23.95 V
T -5.0
P 74.7 kPa

Analog I/O 0.90 12V 3/01
Time 42 seconds faster than GPS

	CO_2	H_2O	Flow
Sample:			
atm:	430	12.7	>250ml
STD 1	(420?)	13.5	0
2			>250ml
3	1112	2.13	100 ml/min

In air?

Settings: STD duration back to 90 sec
Post STD delay 1 min
Time btw STD 240 min
Equilib / disply 1 hr
Licor
Data file duration 90 min

I had values changed these starting the software but now they are back to what they were...

Licor still warming up? Re do STDs in a bit...

12 July 0144 a couple hrs later...

CO_2 327
0.07
H_2O 10.98
0.07
Cell T 51.89
Cell P 101.37
Input V 24.10

Analog I/O 0.86 V
T -4.9
P 74.9 kPa
air

sample flow at 70-80 ml/min
water flow at 0.5 gpm each

0455 - tried snooping for leak in 1138 ppm line but didn't see / any thing. ~~Tried~~
Next exp:
turned off ~~reg~~ tank again to see how long it takes for 10 psi to drop

0607 UTC - OK line has gone to 0 psi but regulator side still good. So leak in btw regulator + line...

~~Tot~~ Found leak in copper line connector. ~~Removed~~ Tried to clip off extra copper tubing going into connector but squeezed the tube shut. Darn.

0730:
310 So cut off cone bit w/
409 hacksaw and put on new
— washer + cone and wrenched
Flow too high → 383 after rebound it tightly shut.
1164 w/ 120 ml/min flow (creeping up)

0811 Snoop shows no more leak there. After STDs run, turned off regulator again to confirm no remaining leak
only waited to 0811 - looks like pressure may have been falling slowly... rats.

1834 ~~Empty~~ Pellet
1915 - Run STDs + exit program
Turn off ~~pump~~ power/pump
Empty Pellet
Remove, trim tubing, for all sample line connectors: though did not muck w/ multiport valve or loose connecting

For 2019:
SNOOP
SPARE PUMP
~~No~~ More air flow meters?
More connectors for tubing (copper or plastic or PFC)

2058 - Restart software.
All values high...
Single CO_2 ~360
Air ~420 ⇒ we had fire drill & two doors closed on line.
STD 1 - X
2 - Flow still good but may
3 - 1114 ~~0.97~~ ~~120~~ have issue w/ leaks/breaks?

come back and run STDs in a little bit...

13 July 0049

Sample				• UNSTICK FLOWMETER • Δ to 120sec STD
AIR	409	7250	12.5	Retake STDs: 409 7250 12.4
1	—	X ←	—	Ball stuck ∅ 12.5
2	384	? ↓	6.8	386 150 4.3→0.9
3	1116 ending rising	? ↓	1	1122 125 0.5

~~Need~~

13 July A:16
• peltier ½ full Trying to empty it.
pCO_2 in position 4 to sucking up air & water doesn't empty.

~17:30 so water loop flow completely stopped so shut off pCO_2 and gases

~~T3~~ 14 July 0144 UTC

• Seawater pump Fixed.
• ~~Gas~~ A second gas leak in 1138 STD found + Fixed (other side of previous leak connection)
• Gas turned on.
• System + plumbing turned back on while on station SL1P-1

	CO_2	Flow	H_2O	STARTING STDS
Sample	275	50 ml/min	13	
Atm	418	>250	13	
STD1	–	0		
2	373	~~0~~250 ml/min	0	
3	1082	100 ml/min	1.3	

STD 2 needs flow restrictor adjusted.

2027 Run STD_{1A} + empty Peltier, and restart
STOP Acquisition
Sample at ~180 ppm !!

POS					
2	Atm	407	100 ml/min	flow?	13.13 H_2O
3	STD 1	406	100 ml/min	"	13.20
4	STD 2	378	"		
5	STD 3	1114	100 ml		1.4

Sample → Flow @ 100 ... seems like it's stuck...
Vent

yes pump turned off and ball still @ 100 ml/min !

• ~~Un~~ Unstick Flow ball by blowing down exit hole.
• Restart pump + software
• empty Peltier Trap

Sample Flow ~~rate~~ @ 70 ml/min and value still @ 191 ppm

15 July 0647
Run STDs, unstick Flow meter:

	~~Sm~~ CO_2	H_2O	Flow
Atm	406	11.2	>250 ml/min
STD1	~~STD~~ ——		0
2	↗382	~~6~~↘4	120
3	↗1113	1	110

Power OFF, EMPTY PELTIER (out, 1/4 full)
Restart power + software
Sample back to 212 ppm

16 July 2019
0906 – Run STDS + drain peltr

Syle	190 and rising as we steam		50ml/min	10.5
AIR	406	>250		9.7
STD1	407	0		9.7
2	375→383	120		6.7→1.5
3	1111→1115	110		1.1→0.8

- Collection stopped
- Pump off
- Peltr emptied
- Pump on
- Restrt program

Disply:
cell T 51.87
P 100.59
In V 24.10
Temp -6.6 C
KPa 73.7
12V 1/01 0.78 (0.5 GPM each)

Gasses 1138 @ 10 psi e 1800 psi
384 @ 10 psi e 1150 psi

16 July 2120 : STDS, Powr off, empty peltier, restrt power + software

17 July 1952:
Δ flow rate from 0.45 to 0.50 and see drop in pCO2 from 246→228 ppm.
Drop was immediate. ? only so sensitive?

20:05 – see that (sample air) flow was low ~30 ml/min. Changed this to 50 using the flow restrictr. The CO2 increased from 228 to 232

Peltier empty process : STDS, stop, empty, strt

CO_2	Flow	H_2O	
232	50ml	11	Sample
408	>250	10.1	Atm
409	0 ml/min	10	STD1
378→383	120	5.6→12	STD2 ← Value closer to actl as it dries out
1111→1117	100	.93→0.8	STD3

STOP + RESTART
~~Sample @~~
Sample flow at 50ml/min and 0.5 GPM each
STDS run and now sample @ 223 ppm

18 July

0843 - on SEC 7 station
STDs run
then test ∅ of flowrate...

Sample at 352 (air) Flow at 50 ml/min, 0.5 gpm (water), 0.85V (Flow M)

increase to 0.6 gpm (esch), ~~1.04V~~ 1.05V
hmm, sample is slowly dropping...
to 348 ppm

0903: And set back to .5 gpm, 0.86 V

1702: Flow was @ 40 ml/min
adjusted to 60 ml/min

1926: Run STDs + empty Peltier trap
Sample 220ish
Atm 402
~~8~~

STD2	374 6	→ 381 4	→ 382 2
STD3	1110 ~~4~~	1.0 ~~4~~	

1929: Restart
Sample ~~210~~ 220 11.5 set STDs for 120sec
Atm 405 12.5
STD1 411 12.4
2 382 3.6 → 384 2.5 384 1.0
~~1016~~ 1114 0.9 → 1119 ~~1.3~~

1932 adjusted flow - was at 0.6 GPM, ~~then~~ down to 0.5 GPM

19 July 2019
0825 - Flow 0.5 GPM
sample air flow 45 to 55 ml/min
Breath test in the box
raises value 249 to ~~252~~
so not much.

0828
empty peltier trap - stds run less than an hour ago so no need to rerun before emptying trap.

increase flow to 55 ml/min.

20 July 2019
0741 - Peltier emptying

	CO_2	Flow	H_2O	water	
Sample	261	(40)	10	0.5	0.79V
Air	~~404~~	>250	8.35	~~0~~	
STD1	404	∅	8		
2	382 → 383	100	4.9 → 1.5		
3	1108 → 1117	100	1.0 → 0.6		

Gases @ 1200 for 382, 1800 for 1138
both @ 10 psi

20 July 2105
stopped program / pump / emptied peltier
sample flow @ 50ml/min

21 July 1048
Sample flow @ 30 ml/min
TSI water flow @ 0.45 gpm V=.66
increased to 0.5 gpm (and V=0.83)
RUN STDS / POWER OFF / EMPTY PELTIER / Restart
ADJUST FLOW of sample

		Flow ml/min	H_2O ?
Sample		~30	
ATM	408	>250	7.5
STD 1			
2	385	110	5.9
3	1118	110	0.5

checked STD before stopping

After restart adjusted sample flow. ~~Seem~~ Increased flow but then to bring back to 50 seems like dial restrictor valve knob was almost back to where it was ... maybe just a ~~small~~ small block in flow? water drop that made its way past?

22 July 1141

H_2O for sample is up at 19!?
not sure what happened ... Peltier trap is only 1/3 to 1/2 full ...
Flow is at 0
Run Atm + STDS ... empty trap.
Maybe from ATM line ?
water

Sample	ppm	flow	H_2O
Air	396	>250	11
STD1			
2	→ 383	110	→ 1.2
3	→ 1115	110	→ 0.6

1242 - finished mucking w/ plumbing
① Flow of sample was Ø
but flow up to multiport could be felt.
other ~~samp~~ gases running through Licor fine so seemed to be multiport valve
② unconnected + reconnected multiport and then flow was great

③ but when hooky air line from peltier trap back in (closed the loop) the flow dropped right down ... something blocking Flow ...

- so examining lines found the plumbing from SHEQ to peltie was crusted inside w/ salt. Disconnected, put DI water through, tapped out water as best as possible & reconnected.

This seems to have fixed it. Flow setpt is back to where it was. H_2O value has dropped back down to 11. back down to

Sample value @ ~317 and maybe still falling.

1250 started new file. ~~Tons~~ of good data. ~~the salted toss the last~~ Don't use the previous hour's data.

2001 - Last STDs and turned system off. Flush w/ fw and pack.

END OF CRUISE