August 21-25, 2017 Barrow station visit

Anne Jefferson

Tuesday, August 21

Arrive 1:30 PM, Flight delayed, stuck in Anchorage overnight

Instruments Serial #s

Neph 1045

CLAP 10.012

SMPS CPC 2452

AOS CPC 2461

Aeth AE33-SO2-00225

Work on pump box

Check carbon vanes on both pumps. Vanes were less than 0.25” worn, didn’t change

Removed and replaced pump filter

Clean pitot

Clean splitter, remove top o-ring as o-ring was too thick to fit around 2” SS pipe

Note: no ½” Swagelock fittings on site, too many ¾” fittings

Note: send new butanol fill bottle or new tubing for fill bottle

Neph CO2 span check:

 Blue Green Red

Total -1.56 -0.36 1.93

Backscatter -0.19 0.57 1.71

PMTs volts 1050 1000 1100

Dark 0 0 172

Reference 142k 228k 92k

K2 6.703 6.638 6.292

K4 0.5113 0.5073 0.5037

Clean AOS CPC: flow cal 0.966 lpm, 16.1 cc/s

Not change CPC Parker filters as they look clean

Over night zero on Neph and CLAP

Wednesday, August 22nd

Replace impactor hepa filter, filter rack and neph hepas last changed in 2015, change next year

Note Tr on CLAP increase on filtered air suspected leak in ref spot

Note slow change in impactor dP with size shift ??

Brooks impactor flow cal

BIOS PID

10.17 10.28 cal: True = 0.9178PID + 1.0265 r2=0.999

15.14 14.95

18.14 17.74

21.14 20.52

24.14 23.24

28.1 26.71

Try CLAP flow cal. note flows are about 40% less than cal in cpd

FILTER MFC flow cal

Bios PID

7.78 10.17 true = 0.759\*PID + 0.203 r2 = 0.999

10.81 14.15

13.96 18.15

17.0 22.16

20.11 26.19

23.14 30.16

26.15 34.16

28.37 37.18

Filter Brooks MFC is dying. Send another

Filter pressure cals, P11=CH20, P12=CH21 P01=CH19

Channel 1 2 3 4 5 6 slope offset

Magn “H2O 1.5 1.25 1.0 0.75 0.5 0.25

Magn hPa 3.736 3.114 2.491 1.868 1.245 0.623

P21 0.95 0.90 0.85 0.80 0.75 0.70 12.454 -8.095

P22 0.96 0.91 0.86 0.81 0.75 0.71 13.908 -9.271

P23 0.95 0.89 0.85 0.79 0.75 0.69 12.021 -7.657

P24 0.94 0.89 0.84 0.79 074 0.69 12.454 -7.97

P25 0.93 0.88 0.83 0.78 0.73 0.68 12.454 -7.846

P26 0.96 0.92 0.86 0.81 0.77 0.72 12.785 -8.56

P27 0.95 0.90 0.85 0.79 0.75 0.70 7.55 -4.288

P28 0.94 0.90 0.84 0.79 0.74 0.69 12.226 -7.805

Clean SMPS CPC #2452 cal 0.9824 lpm 16.37 cc/s

Overnight filter on AE33

Thursday, August 24, 2017

Take apart CLAP to figure out flow path and possible leak

Top > sample filter > solenoid > manifold >out back >in top > ref filter > solenoid > manifold >valve > MFM >out back

Realize problem was in wrong flow cal for CLAP, use flow prior to fixing in Sept 2016 and not Oct 2016

CLAP flow cal

Volts Bios previous cal

1.639 0.128 0.198 CAL: -0.4345; 0.6831x;-0.3252x^2;0.0715x^3

1.903 0.179 0.319 Q: 1.0

2.204 0.256 0.491

2.544 0.373 0.73

2.762 0.479 0.91

3.097 0.689 1.23

3.219 0.784 1.37

3.331 0.875 1.49

3.350 0.889 1.51

3.48 1.022 1.681

3.62 1.163 1.86

3.737 1.298 2.02

3.875 1.491 2.224

4.035 1.727 2.46

Aethelometer

Tape adv. left 174

Flow report std: NIST

TATNmax: 120

Starting values;

Flow sigma: 5014 Flow 1:3488 Pump:625 Fstatus sigma:622 F1status: 509

Cstatus: 10 CP:266 Valve status:00000

C1: 18.47 C2:14.54 C3: 13.14 C4: 11.58 C5: 10.35 C6:7.77 C7: 7.19

Kmax: 0.015 Kmin: -0.005

Manual Flow calibration: p.63

T: 21.11 C P:101325 Pa note: no reported voltages or results, cal done internally

F1: 0.9122 lpm F2: 2.723 lpm F3: 4.473 lpm

After cal values;

Flow sigma: 5014 Flow 1:3688 Pump:625 Fstatus sigma:628 F1status: 528

Cstatus: 10 CP:266 Valve status:00000

Leak Test:

Flow thru tape: 4.183 Flow thru pad: 4.668 leakage: 10.4% pass test

Stability Test:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel | Spot1 | Spot2 | Spot1 | Spot2 |
| 1 | 16 | 3 | 216 | 511 |
| 2 | -17 | 5 | 297 | 669 |
| 3 | -19 | 22 | 301 | 724 |
| 4 | 42 | 252 | 344 | 812 |
| 5 | -1 | 59 | 414 | 911 |
| 6 | -56 | -21 | 400 | 976 |
| 7 | -21 | 6 | 464 | 1144 |

Clean Air Test:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel | Spot1 | Spot2 | Bc spot1 | Bc spot2 |
| 1 | 88 | 117 | 196 | 595 |
| 2 | 40 | 103 | 270 | 768 |
| 3 | 45 | 131 | 294 | 823 |
| 4 | 99 | 370 | 302 | 903 |
| 5 | 69 | 191 | 321 | 1014 |
| 6 | 47 | 171 | 414 | 1123 |
| 7 | 83 | 198 | 413 | 136 |

Ae33 passed clean air and stability tests despite high signal/noise on channel 4. Ae33 is a black box, so unable to change/check detector or light source voltages. No neutral density filters came with instrument so can’t check light source. Haven’t noticed high signal for channel #4 in data, so maybe ok.

SMPS

Sheath flow set in lab with PSLs set to ~3.7 lpm with 1 lpm sample flow in 2016

Adjusting flow is an iterative process of measure flow, set flow in software, change valve from check to measure position, restart prg, stop prg, set valve to check position, measure flow, set cal to measure position, set cal in software, restart program

5.0 lpm flow has a slope:4.1 and offset:0 in Ni-DAQmxscales/scdma loop flow

Check scans under varying flow conditions: 5 lpm Sheath:1 lpm sample and settings in prior system of 5 lpm Sheath:0.5 lpm sample 5:1 v 10:1 ratios

Signal too low (<100cc) to tell difference. Run overnight with 10:1 ratio

Note there is no way to calibrate sample flow sensor (dP system) in SMPS

Check inlet RH: Inlet 20.7% reference:26.3 Swap cables inlet:20.3 ref:25.8

Swap RH sensor between Vaisalas

Friday August

Input cals

Lab inventory of aerosol supplies

Pack crate, ship via USPS

Train Ross on SMPS flow cal procedure

Clean house

Note CLAP values were for clap 10.011 and not 10.012

Change spot sizes.

Set SMPS to 5.0 lpm sheath and 1.0 lpm sample, SMPS is hard-coded for these flows

Most all SMPS settings are hard-coded

Smoke test of size distribution and signal response

AOS drawer

3 neph lamps

NC Red Hat solenoid

2 used parker filters

Vaisala cable

3 ft conductive tubing

Box Clap filters

¾ tube vacuum grease

9 ft ¼” polyethylene tubing

Ae33 fuses

Set of carbon vanes

Rack screws

Comport cable

Molex pins and pusher

Misc ¼” swagelock

Back Closet

Hepa filter 1 new and 3 used

Set of carbon vanes

2 boxes of large ½” and ¾” swagelock

½” and ¼” tubing

several boxes of Asco NO and NC valves