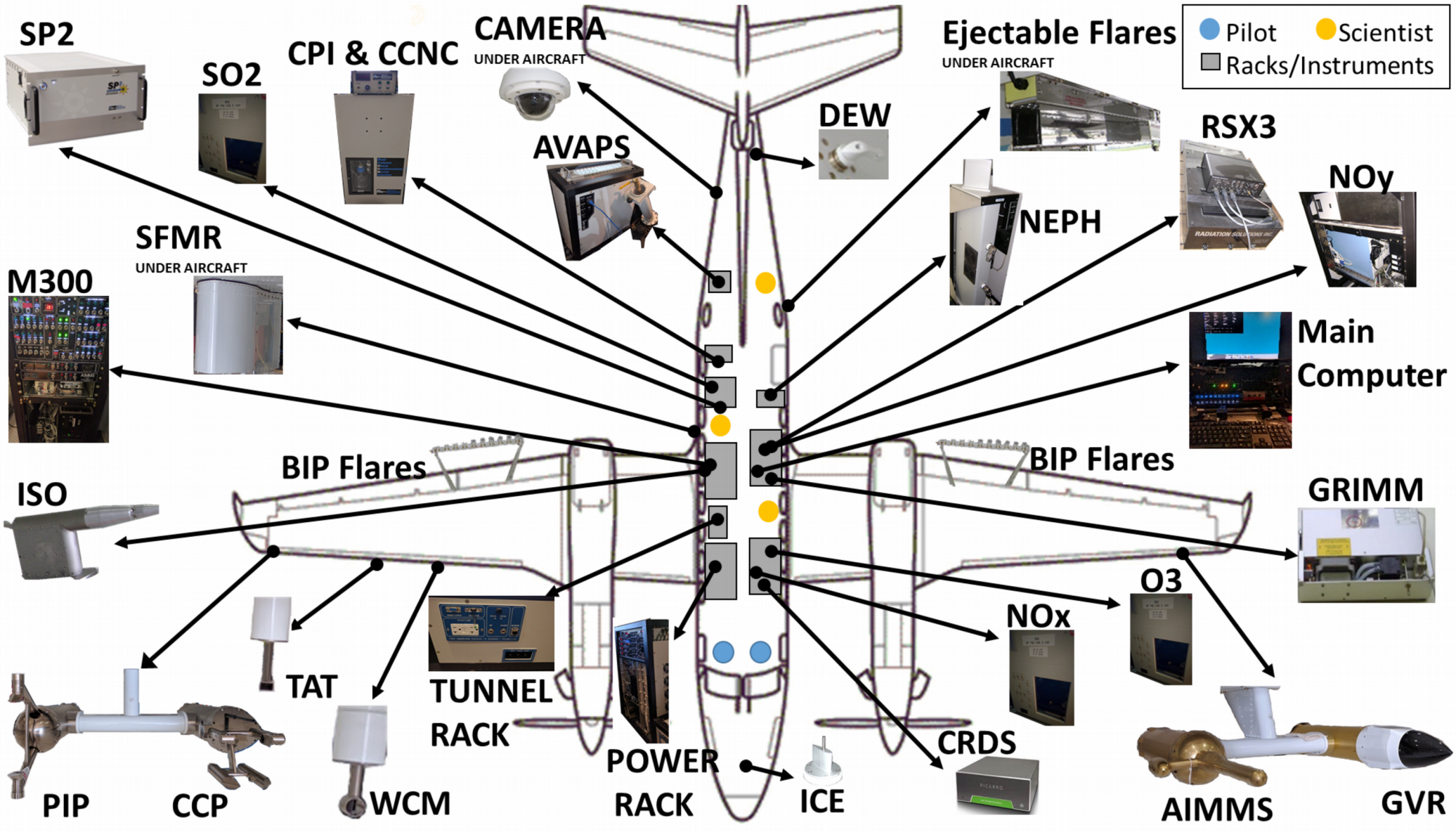
Remote Sensing: Flights, Theory, and Data

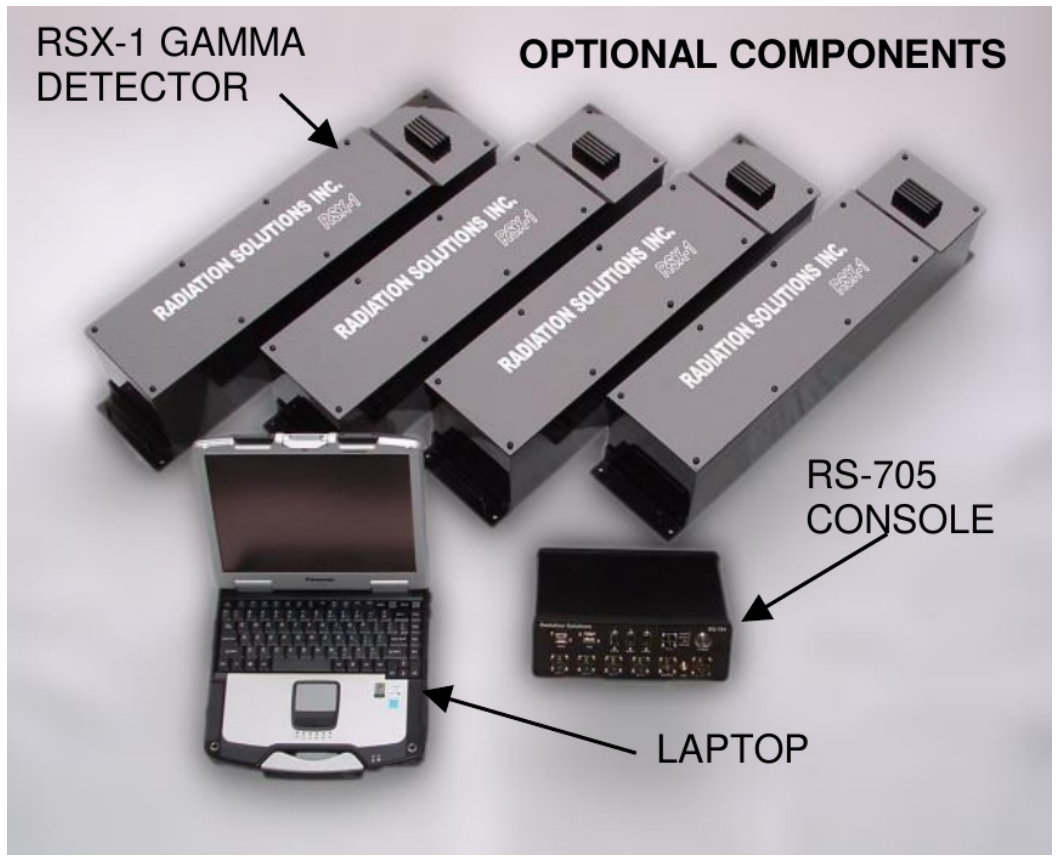


Dr. David Delene

University of North Dakota

Radiation Solutions Gamma Detector (RSX-3)

Operating Principles - Glows of Sodium-Iodide
Primary Measurements – Gamma Ray Spectrum (Upward)
Quality Control – Valid Background
Flight Profile – Low Altitude
Data Acquisition – Serial Data



Radiation Solutions Gamma Detector (RSX-3) “log” File (*log.rsx3)
4 April 2017 KMA Test Flight

Terminal

Terminal | Terminal | Terminal | Terminal

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^\^@à^^<80>^\^@^\à<8e>àü<8e>^@^\^^þ^\ü<9e>à^\ü^N~ø^\pþ^\^@àþ^\^\àþ^Nÿü^\pð^\ü^\ü^\à^\^@àþ^@^\^\à^N^@àà^@^\àð<8e>à^\à^\^@àà^@^\
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Prosensing G-Band (183 GHz) Water Vapor Radiomenter (GVR)

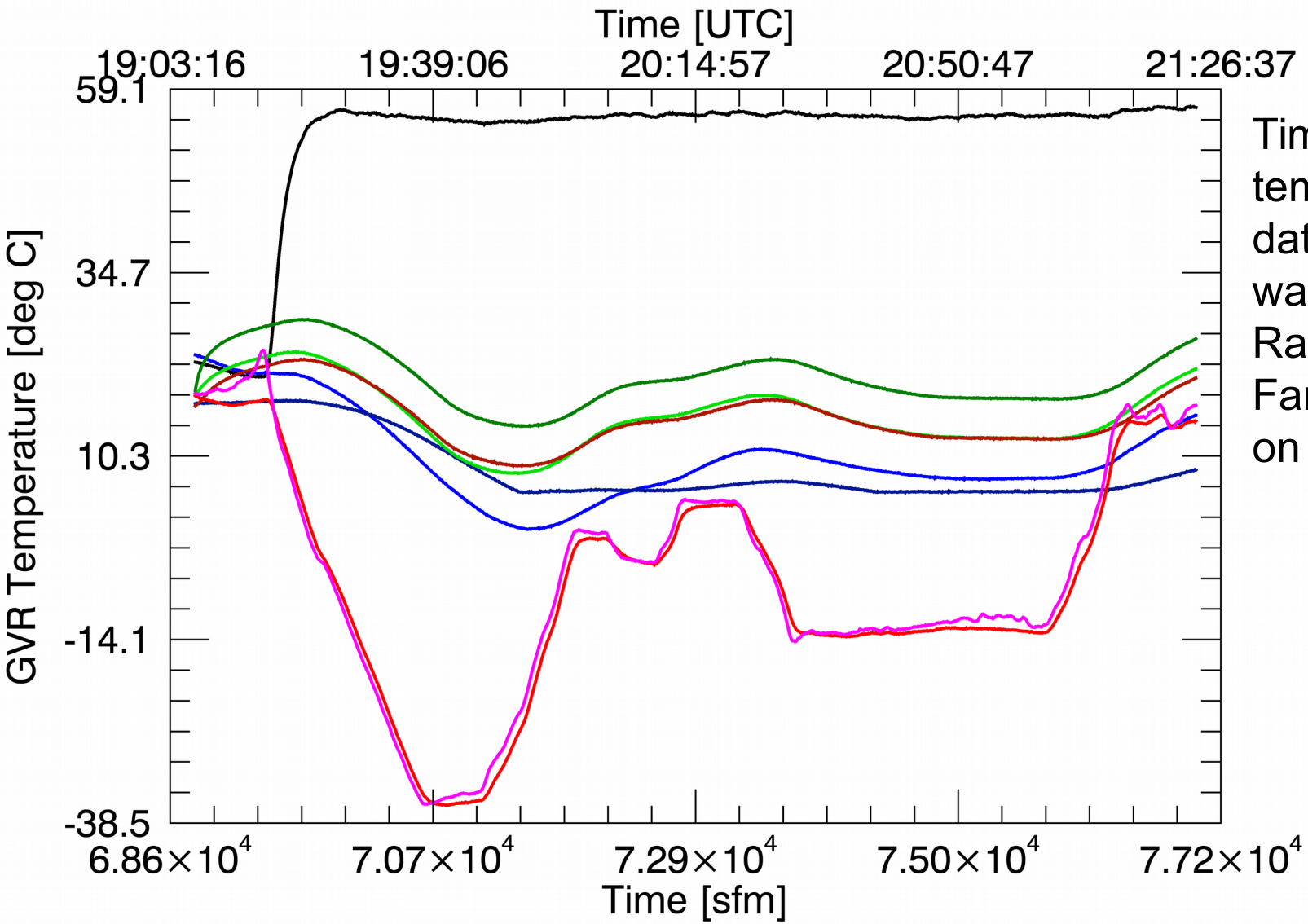
Operating Principles - Brightness Temperature

Primary Measurements – Precipitable Water Vapor and Liquid Water Path

Quality Control – Valid Calibration

Flight Profile Consideration – High Above Clouds

Data Acquisition – Serial Data



Time series plot of the temperature steam data from the G-barnd water vapor Radiometer taken near Fargo, North Dakota on 4 April 2017.

G-Band Water Vapor Radiomenter "log" File (*log.gvr) – Level 1 Data 4 April 2017 KMA Test Flight

Terminal

Terminal | Terminal | Terminal | Terminal | Terminal

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T 0054364 0055126 0049982 0050919 0051355 0049720 0050800 0051062
H 0001097811 0001411212 0001506223 0001172968 0000596 596
H 0001097895 0001411519 0001506512 0001173114 0000604 604
H 0001099104 0001411997 0001507463 0001173684 0000611 611
H 0001098955 0001412544 0001507234 0001173509 0000619 619
H 0001099088 0001413338 0001508432 0001174198 0000626 626
H 0001099746 0001413358 0001508148 0001174124 0000634 634
H 0001100040 0001414407 0001509319 0001174826 0000641 641
H 0001100413 0001414123 0001509135 0001174492 0000649 649
H 0001101518 0001414833 0001510172 0001175314 0000656 656
H 0001101245 0001415113 0001510122 0001175054 0000664 664
H 0001101857 0001416140 0001510683 0001175587 0000672 672
H 0001102392 0001416286 0001511332 0001175763 0000679 679
H 0001103299 0001417033 0001511303 0001176162 0000687 687
H 0001103103 0001417451 0001512222 0001176501 0000694 694
H 0001103606 0001418004 0001512583 0001176485 0000702 702
H 0001104010 0001418459 0001513158 0001177035 0000709 709
H 0001104352 0001418575 0001513028 0001176750 0000717 717
H 0001104662 0001419387 0001513971 0001177434 0000725 725
H 0001105229 0001419443 0001513964 0001177433 0000732 732
H 0001105562 0001419971 0001514780 0001178128 0000740 740
B 0001105771 0001420201 0001514587 0001177968 0000747 747
B 0001106426 0001421040 0001515141 0001178040 0000755 755
B 0001106568 0001421205 0001515687 0001178603 0000763 763
B 0001107197 0001421844 0001515768 0001178574 0000770 770
B 0001107311 0001422052 0001516292 0001178916 0000778 778
B 0001107820 0001422414 0001516181 0001178763 0000785 785
B 0001108437 0001423192 0001517378 0001179644 0000793 793
B 0001108513 0001423378 0001517098 0001179206 0000801 801
B 0001109000 0001423978 0001518336 0001180166 0000808 808
B 0001109259 0001424235 0001518437 0001179911 0000816 816
                                                    80,1          0%
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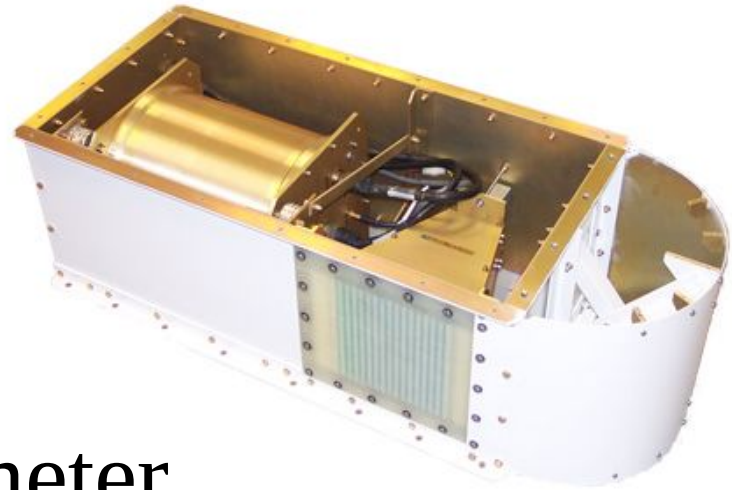
Prosensing Stepped Frequency Microwave Radiometer (SFMR)



Operating Principles – Radiometer (4.6 - 7.2 GHz)

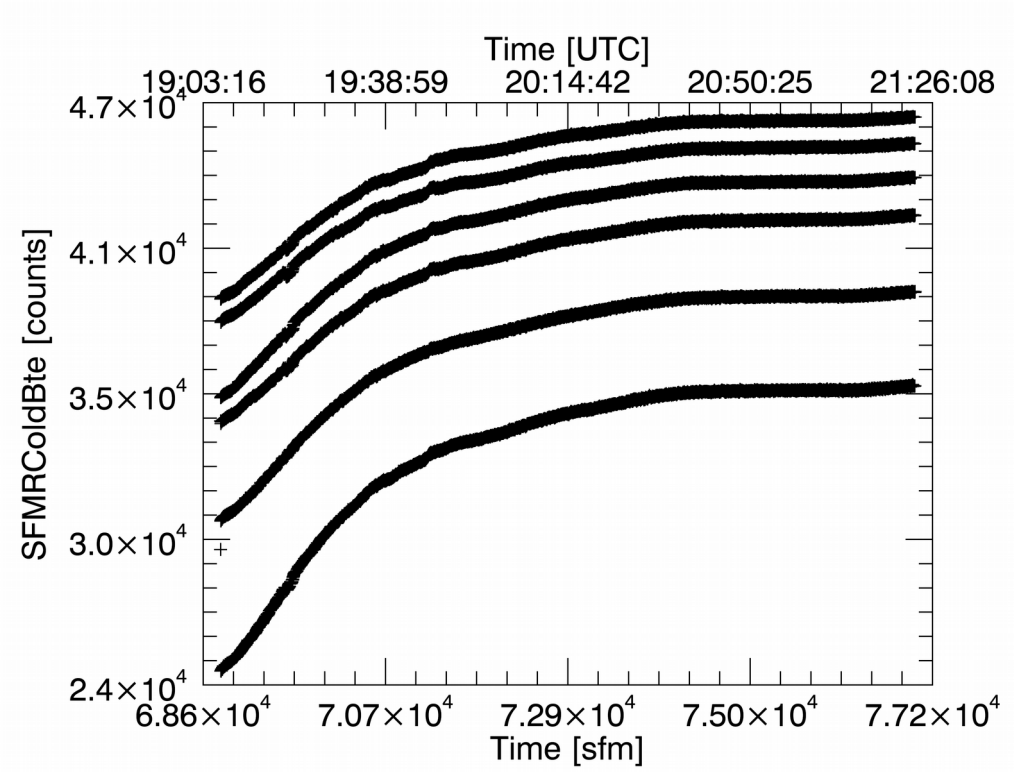
Primary Measurements – Radiometric Brightness Temperature at Six Frequencies (Surface Wind Speed and Rain Rate Derived)

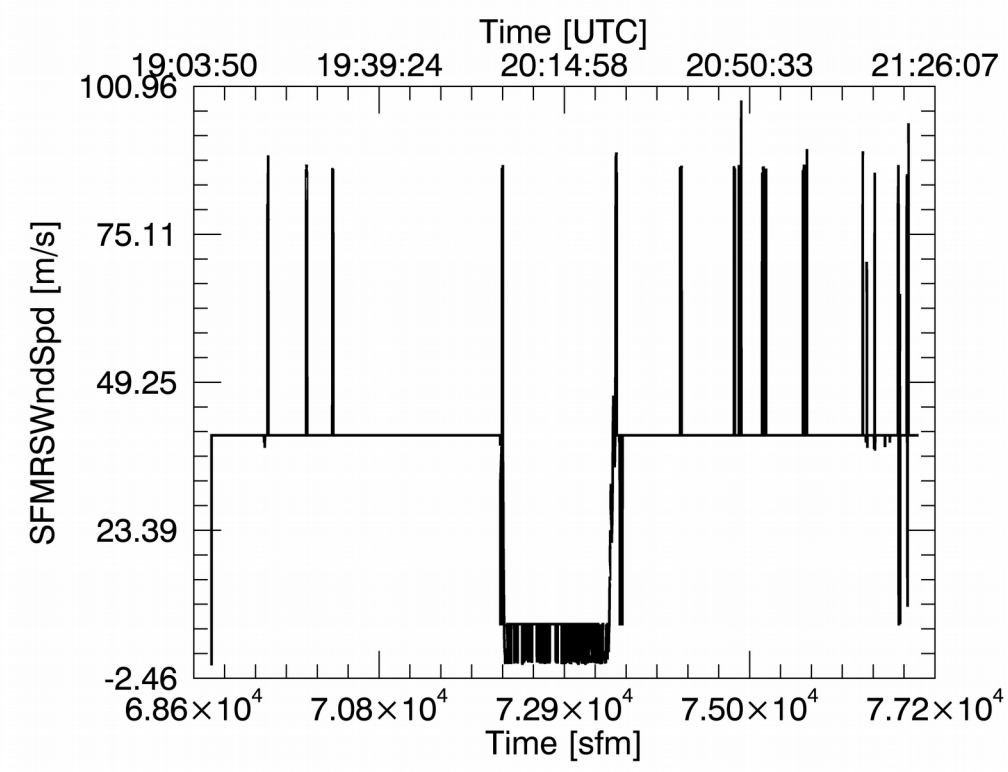
Quality Control – Reasonable Values

Flight Profile Consideration – Level Flight

Data Acquisition – Serial Data In/Out (Requires Flight Data)

Stepped Frequency Microwave Radiometer (SFMR)



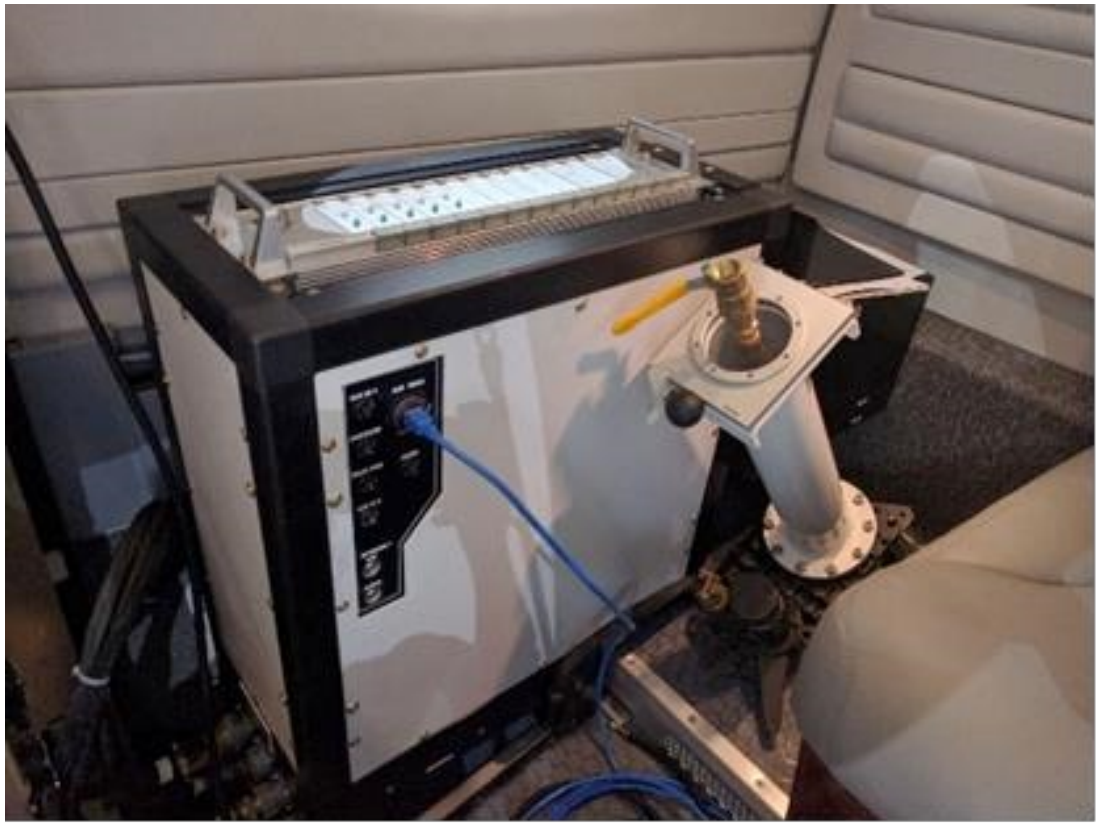


Time series plots showing Level 1 (left plot) and Level 2 (right plot) Stepped Frequency Microwave Radiometer (SFMR) data taken near Fargo, North Dakota on 4 April 2017.

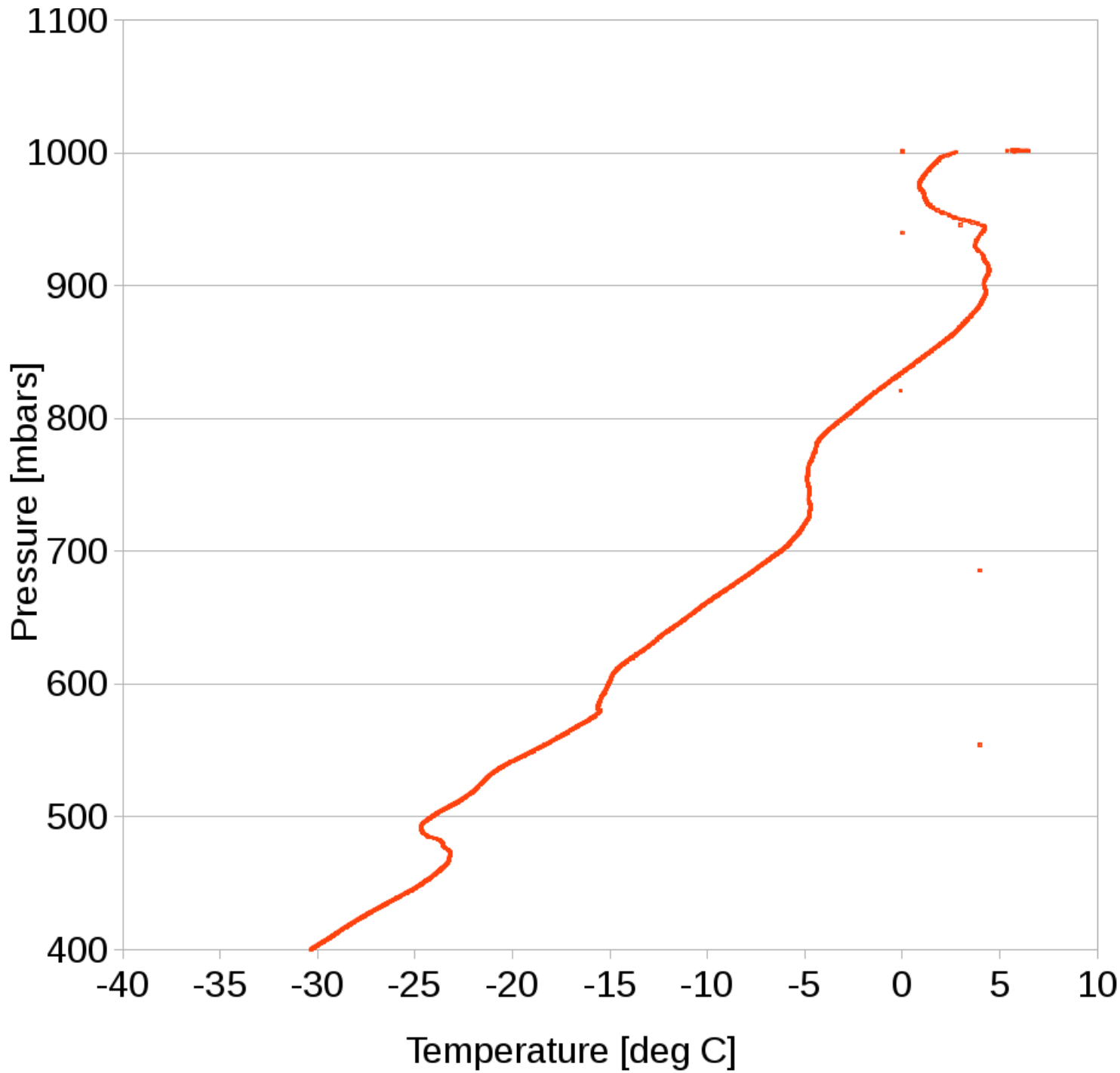
Vaisala Dropsonde (RD94)

Operating Principles – Many
Primary Measurements – Temperature, Relative Humidity, Wind, Pressure, Position
Quality Control – Comparisons
Flight Profile Consideration – Find Targets, Limited Number of Sondes Air Borne at a Time
Data Acquisition – Serial Data, Stored on Local System

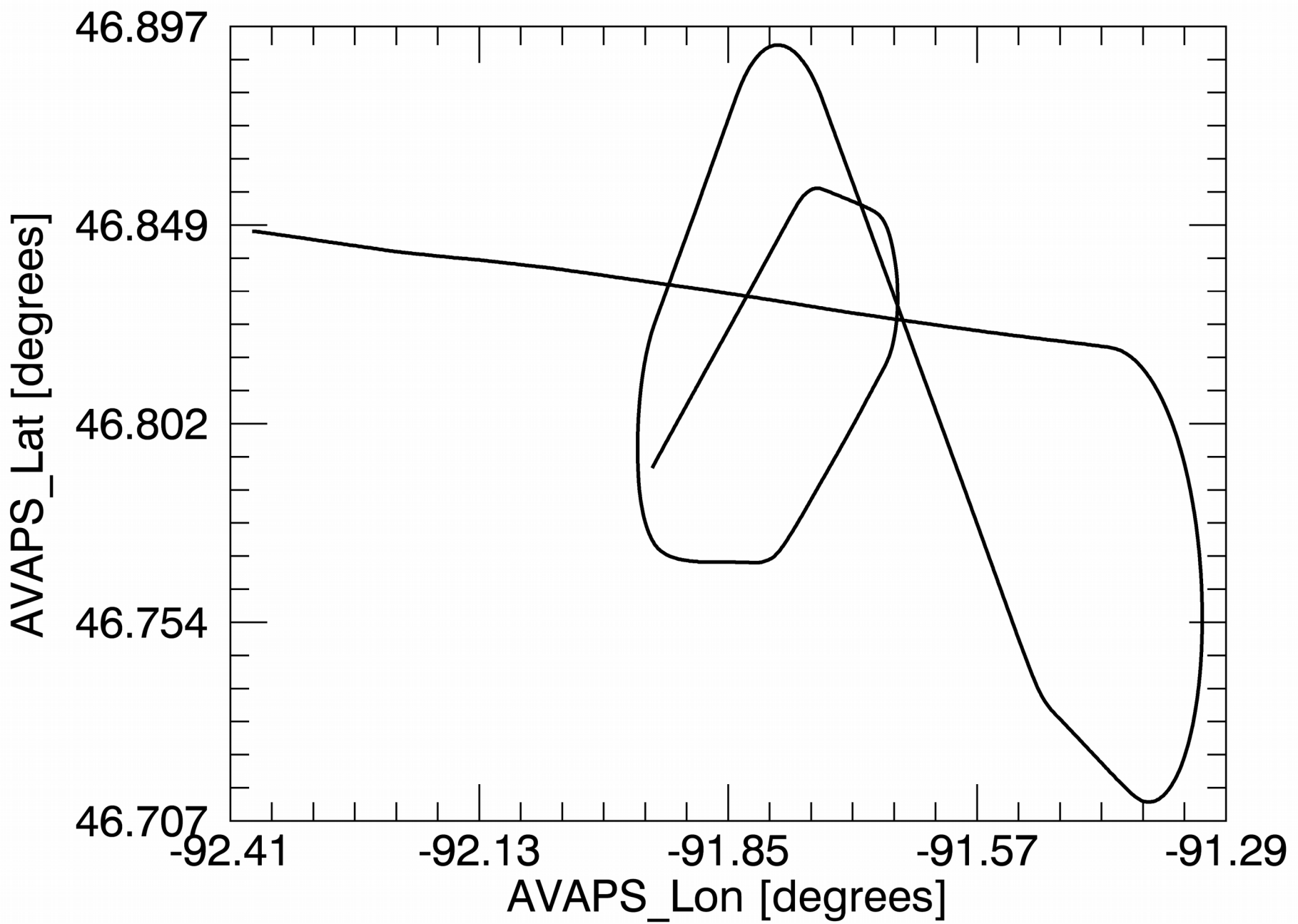
Vaisala Dropsonde (RD94)



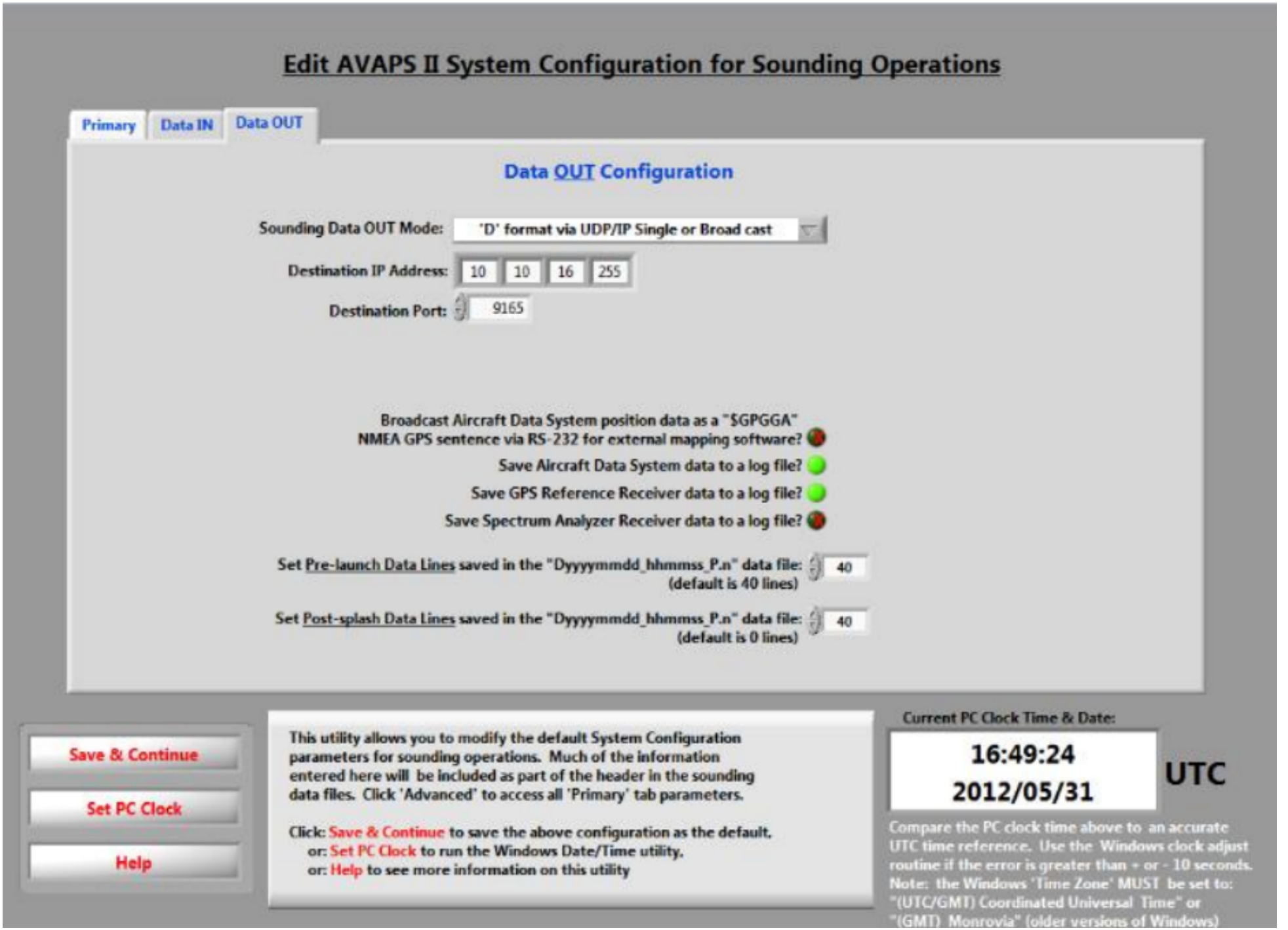
Vaisala Dropsonde Profile: 29 March 2017



Position Data from Vaisala Dropsonde (RD94)



AVAPS Setup to Send “D” File to M300



Dropsonde “D” File Data: D20170329_155853.1
Send from M300 to Ground via Sat Modem

Terminal

Terminal | Terminal | Terminal | Terminal | Terminal | Terminal

```
AVAPS-T01 STA 153945063 170329 155042.85
AVAPS-T01 COM            UTC      UTC        Air     Air      Rel    Wind    Wind    Vert       GPS        GPS      Geopoten GPS   Sonde
AVAPS-T01 COM   Sonde    Date     Time      Press    Temp    Humid   Dir     Spd     Veloc   Longitude  Latitude  Altitude Wnd   RH1
AVAPS-T01 COM    ID     yymmdd  hhmmss.ss   (mb)    (degC)   (%)    (deg)   (m/s)   (m/s)     (deg)      (deg)      (m)    Sat    (%)
AVAPS-T01 COM --------- ------ --------- ------- ------ ------ ------ ------ ------ ---------- ---------- -------- --- ------
AVAPS-D01 P10 153945063 170329 155102.00 9999.00  99.00 999.00 272.41 159.12  -0.46  999.000000  99.000000 99999.00   8 999.00
AVAPS-D01 P00 153945063 170329 155102.25  808.66  25.22  24.11 272.47 159.44  -1.38  -91.940808  46.835771 99999.00   8  24.11
AVAPS-D01 P10 153945063 170329 155102.50 9999.00  99.00 999.00 272.61 159.08  -1.07  999.000000  99.000000 99999.00   9 999.00
AVAPS-D01 P00 153945063 170329 155102.75  808.67  25.22  24.08 272.55 158.76  -0.77  -91.939768  46.835738 99999.00   9  24.08
AVAPS-D01 P10 153945063 170329 155103.00 9999.00  99.00 999.00 272.56 158.57  -1.27  999.000000  99.000000 99999.00   9 999.00
AVAPS-D01 P00 153945063 170329 155103.25  808.67  25.23  24.10 272.53 158.74  -1.03  -91.938728  46.835707 99999.00   9  24.10
AVAPS-D01 P10 153945063 170329 155103.50 9999.00  99.00 999.00 272.57 158.47  -1.77  999.000000  99.000000 99999.00  10 999.00
AVAPS-D01 P00 153945063 170329 155103.75  808.66  25.23  24.09 272.59 158.48  -1.50  -91.937690  46.835675 99999.00  10  24.09
AVAPS-D01 P10 153945063 170329 155104.00 9999.00  99.00 999.00 272.53 158.88  -1.20  999.000000  99.000000 99999.00  10 999.00
AVAPS-D01 P00 153945063 170329 155104.25  808.70  25.24  24.10 272.36 158.72  -0.32  -91.936650  46.835643 99999.00  10  24.10
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AVAPS-D01 P10 153945063 170329 155105.00 9999.00  99.00 999.00 272.38 158.33  -1.52  999.000000  99.000000 99999.00  10 999.00
AVAPS-D01 P00 153945063 170329 155105.25  808.48  25.23  24.10 272.43 158.70  -1.52  -91.934571  46.835580 99999.00  10  24.10
AVAPS-D01 P10 153945063 170329 155105.50 9999.00  99.00 999.00 272.45 159.14  -1.18  999.000000  99.000000 99999.00  10 999.00
AVAPS-D01 P00 153945063 170329 155105.75  808.62  25.25  24.13 272.44 158.21  -1.09  -91.933531  46.835548 99999.00  10  24.13
AVAPS-D01 P10 153945063 170329 155106.00 9999.00  99.00 999.00 272.45 157.96  -1.10  999.000000  99.000000 99999.00  10 999.00
AVAPS-D01 P00 153945063 170329 155106.25  808.69  25.26  24.12 272.50 157.98  -1.01  -91.932496  46.835515 99999.00  10  24.12
AVAPS-D01 P10 153945063 170329 155106.50 9999.00  99.00 999.00 272.51 158.29  -0.99  999.000000  99.000000 99999.00  10 999.00
AVAPS-D01 P00 153945063 170329 155106.75  808.66  25.27  24.10 272.43 159.10  -0.82  -91.931458  46.835481 99999.00  10  24.10
AVAPS-D01 P10 153945063 170329 155107.00 9999.00  99.00 999.00 272.42 158.85  -0.85  999.000000  99.000000 99999.00  10 999.00
AVAPS-D01 P00 153945063 170329 155107.25  808.70  25.29  24.08 272.53 159.02  -0.85  -91.930417  46.835449 99999.00  10  24.08
AVAPS-D01 P10 153945063 170329 155107.50 9999.00  99.00 999.00 272.63 158.68  -1.11  999.000000  99.000000 99999.00  10 999.00
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