

Airborne Data Processing and Analysis (ADPAA)



# **EUFAR ICCP Workshop**

### On

### Data Processing, Analysis and Presentation Software

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### **Computer Platform Requirements**

- Data Processing
  - Flight and Project Processing Scipts
    - Linux (Redhat, Fedora, Ubuntu)
- Analysis
  - Cplot/Cplot2 Visualization Packages
    - Linux, Mac, Windows



# Package Programming Language(s)

- Main Language
  - IDL (GDL) Binary Version Available (No License Fee)
- Additional Languages
  - Python
  - Perl
  - Bash
  - Csh
  - FORTRAN
  - C
  - Matlab
  - Scilab

delene@ice:/nas/und/NorthDakota/2014/Aircraft/CitationII_N555DS/FI	
[delene@ice 20140306 174537]\$ process all ophir	
Processing the 14_03_06_17_45_37.sea file D	one
Creating 14_03_06_17_45_37.applanix.1Hz D	one
Creating 14_03_06_17_45_37.analog.1Hz D	one
Processing the 14_03_06_17_45_37.analog.??? file D	one
Processing the 14_03_06_17_45_37.2dc file D	)one
Processing the 14_03_06_17_45_37.serial.GPS.raw D	)one
Creating 14_03_06_17_45_37.physical.clean D	)one
Creating 14_03_06_17_45_37.physical.filtered D	)one
Creating the 14_03_06_17_45_37.physical.10Hz file D	)one
Creating the 14_03_06_17_45_37.physical.1Hz file D	)one
Processing the 14_03_06_17_45_37.physical.? file D	)one
Creating 14_03_06_17_45_37.basicP1T1.1Hz D	)one
Creating 14_03_06_17_45_37.basicP1T2.1Hz D	)one
Creating 14_03_06_17_45_37.basicP2T1.1HzD	)one
Creating 14_03_06_17_45_37.basicP2T2.1HzD	)one
Creating 14_03_06_17_45_37.basic.10Hz D	)one
Creating 14_03_06_17_45_37.basic.1HzD	)one
Processing the 14_03_06_17_45_37.counts.pcasp.raw	one
Creating 14_03_06_17_45_37.basic.8HzD	one
Processing the 14_03_06_17_45_37.counts.cdp.raw	one
Creating 14_03_06_17_45_37.King.raw	one
Processing the 14_03_06_17_45_37.applanix.raw	one
Creating 14_03_06_17_45_37.angles.applan1X.1HZ	one
Creating 14_03_06_17_45_37.King.IHZ	one
Creating 14_03_06_17_45_37.conc.cdp.1HZD	one
Creating 14_03_06_17_45_37.egg.raw	one
Creating 14_03_06_17_45_37.wind.raw	lone
Creating 14_03_06_17_45_37.nevwc.raw Tite	lone
$C_{rooting}$ 14_05_06_17_45_37.nevwc.1HZD	lone
Creating 14_03_06_17_45_37.Set 14(.0F5.10SetD	lone
Creating 14_03_06_17_45_27_550pm ccat ray	
Creating 14 03 06 17 45 37 conc str pcasp raw	)one
Creating 14_03_06_17_45_37.comc_stp.pcasp.raw	)one
Creating 14 03 06 17 45 37 pir file	)one
Using 14 03 06 17 45 37 2dc to create 2DC images $D$	)one
[dolpaped co 201/0206 17/5271¢	one

## **Data Formats Supported**

- Input from any \*.sea acquisition file from the Science Engineering Associates (SEA) Data System
  - Addition Level 1 models could additional data system.
  - Conversion scripts support instrument recorded data.
- Main Data Format
  - Gzipped (compressed) NASA/UND ASCII 1001 Format
- Output Format
  - NASA/UND ASCII 1001 Format
  - 2013 ICARTT NASA Format (ict)
  - NetCDF
  - KML (Google Earth)
- Data File Import Routines
  - IDL, Python, Matlab, Scilab, Igor
- Conversion Routines
  - Too many to list.

### **Instruments Supported**

#### • From Level 1

- 2-DC Probe File 2dc.spec.raw
- Aventech AIMMS ID 1 Stream serialA.aimms.raw
- Aventech AIMMS ID 2 Stream serialB.aimms.raw
- Applanix Position and Orientation Systems (POS) applanix.raw
- BMI Mixing Condensation Particle Counter (MCPC) Stream File serial.mcpc.raw
- DMT Cloud Imaging Probe (CIP) Housekeeping File house.cip.raw
- DMT Cloud Condensation Nuclei Counter (CCNC) Concentration Stream serialc.ccnc.raw
- DMT Cloud Condensation Nuclei Counter (CCNC) Housekeeping Stream serialh.ccnc.raw
- DMT Cloud Droplet Probe (CDP) Counts File counts.cdp.raw
- DMT Passive Cavity Aerosol Spectrometer Probe (PCASP) Stream File counts.spp\_pcasp.raw
- DMT Photoacoustic Extinctiometer (PAX) Stream File serial.pax.raw
- DMT Precipitation Imaging Probe (PIP) Housekeeping File house.pip.raw
- Picarro Cavity Ringdown Spectrometer (CRDS) Stream File serial.crds.raw
- TSI Condensation Particle Counter (CPC) Stream File serial.cpc.raw
- From Level 2 Files
  - Citation Research Aircraft Winds File REAL.winds.raw
  - Chilled Mirror Humidity File egg.raw
  - DMT Cloud Droplet Probe (CDP) Concentration File conc.cdc.raw
  - Tunable Diode Laser Hygrometer (TDL) Humidity File tdl.hum.raw
  - TSI Condensation Particle Counter (CPC) Concentration File conc.cpc.raw
  - DMT Passive Cavity Aerosol Spectrometer Probe (PCASP) Concentration File conc.spp200.raw
- From Level 4 Files
  - Basic Meteorological Parameters File basic.raw
  - DMT Cloud Condensation Nuclei Counter (CCNC) Concentration File dmtccn\_conc.raw
  - DMT Cloud Condensation Nuclei Counter (CCNC) Average Concentration File dmtccn\_conc\_avg.raw
  - DMT Cloud Condensation Nuclei Counter (CCNC) Supersaturation Spectrum File dmtccn\_ss\_efit.raw

## Availability and Copyright

- SourceForge Repository (SVN)
  - Current version 2,767
  - 2 Admins
  - 12 Active Developers
  - 6 Inactive Developers
- Download
  - svn checkout svn://svn.code.sf.net/p/adpaa/code/trunk adpaa-code
- GNU/GPL v3 Licensed
  - Have to remain open, even when forked.

### References

Delene, D. J., 2016: Airborne Data Processing and Analysis.

Source Forge, http://sourceforge.net/projects/adpaa (Accessed January 28, 2016).

- Delene, D. J., Airborne Data Processing and Analysis Software Package, Earth Science Informatics, 4(1), 29-44, 2011, URL: http://dx.doi.org/10.1007/s12145-010-0061-4, DOI: 10.1007/s12145-010-0061-4.
- Delene, D. J., Suitability of North Dakota for Conducting Effective Hygroscopic Seeding, Journal of Weather Modification, 48, 43-67, 2016.

Web Site - https://sourceforge.net/projects/adpaa/

Wiki - http://adpaa.sourceforge.net/wiki/index.php/Main\_Page

# **Data Processing**

# •Data Quality Control

- Calibration Checks
- Data Missing Values Codes
- Levels of Data Processing
- Raw Recorded Data
- Engineering to Physical Units
- Single Instrument Data Files
- Combined Instrument Data File
- Data Quality Assurance
  - Scientific Data Review
  - Scripts Search for Unrealistic Values



# **Comments on Scientific Data**

- Quick Visualization of data is very Important.
  - Create a preliminary version of the data using automated processing scripts.
  - Create a final data set after the project is over by applying manual edits to the "raw" data files which replace "bad" data with missing value codes.
- Archive the raw data and any editing files.
- Work with ASCII data as much as possible.
  - Compress ASCII files.
- Use a standard data format, which includes Meta data in all data files.

### Scientist Know Calibrations are Important; However, Software Processing can be just as Important

