**Data files for CLAP paper figures and tables**

**2017-10-04/JAO**

Figure 1: (a) Photograph of CLAP, and (b) cross-sectional view of flow and optical paths in upper section and three-dimensional view of CLAP internal configuration in lower section. Scale on ruler in left image is in millimeters. An annotated version of (b) is included in the Supplement (Fig. S1).

**No data files needed**

Figure 2: Calculated sample efficiency of particles reaching the CLAP filter

**Spreadsheet with calculations is in /aer/doc/inst/clap/work/CLAP\_paper/CLAP\_eff.xlsm.**

Figure 3: Normalized spectral output of light source for blue, green, and red channels, and spectral sensitivity of detector (black curve).

**Spreadsheet with calculations is in /aer/doc/inst/clap/etc/CLAP\_spectral/CLAP\_sensor\_sensitivity.xlsx**

**Data used in Table 1 are in**

**aer/doc/inst/clap/mfg/all/CLAP\_mfg\_summary.xlsx!spectral**

Figure 4: Example of photographic analysis of spot area. Numbers 1-8 above each spot indicate spot number, while the numbers below each spot indicate spot area in mm2.

**Data from comparison of manual vs automatic methods are in /aer/doc/inst/clap/work/CLAP\_paper/CLAP\_spot\_size\_manual.xlsx**

**Code for automatic method is in /aer/doc/inst/clap/sw/src/spots\_interactive\_v4.zip**

Figure 5: Standard deviation of attenuation coefficient measured by nine CLAPs (1-hr averages, 529 nm wavelength). Line indicates slope of regression, forced through the origin.

**Data are in**

**/aer/sfd/work/2017/clap\_precision/precision\_pall\_1h.xlsx**

**Data for Table 2 are in**

**/aer/sfd/work/2017/clap\_precision/precision\_pall\_1m.xlsx /aer/sfd/work/2017/clap\_precision/precision\_azumi\_1h.xlsx /aer/sfd/work/2017/clap\_precision/precision\_azumi\_1m.xlsx** **/aer/sfd/work/2017/clap\_precision/precision\_summary.xlsx**

Figure 6: Standard deviation of attenuation coefficient measured on filtered air, as a function of averaging time. Thick black line with solid symbols represents the measurement data based on 8 h of measurements/spot; thin black line with open symbols shows the measurement data when each spot was sampled for 1 week; red line represents approximate slope for 5-100 s averaging time; blue line represents approximate slope for 2 min to 1 day averaging times.

**Noise analysis methodology is described in**

**/aer/doc/inst/clap/work/clapnoise/README.TXT**

**Final analysis and results are in**

**/aer/doc/inst/clap/work/clapnoise/all\_20170317/results\_all.xlsx**

Figure 7: Uncertainty of CLAP measurements of attenuation coefficient as a function of averaging time and attenuation coefficient, expressed as the 95 % confidence level.

**Calculations are in**

**/aer/doc/inst/clap/work/clapuncert/CLAP\_uncertainty.xlsx**

Figure 8: Uncertainty of CLAP measurements of absorption coefficient (95 % confidence level) as a function of attenuation coefficient, for various values of single-scattering albedo (SSA) and averaging time (dt). Solid lines are all for 30 min averaging time, dashed lines are for other averaging times as noted in the legend

**Calculations are in**

**/aer/doc/inst/clap/work/clapuncert/CLAP\_uncertainty.xlsx**

Figure 9: Percent uncertainty of 30-min average light absorption coefficient as a function of single-scattering albedo and attenuation coefficient. The median uncertainty and inter-quartile range are shown for values measured for 2013-2016 at eight sites (ARN, El Arenosillo, Spain; BND, Bondville, USA; BRW, Barrow, USA; GSN, Gosan, South Korea; LLN, Mt. Lulin, Taiwan; MLO, Mauna Loa, Hawaii; SUM, Summit, Greenland; THD, Trinidad Head, USA). Uncertainties are given at the 95 % confidence level.

**Data extraction and processing are documented in**

**/aer/doc/inst/clap/work/clapuncert/clap\_uncert.R /aer/doc/inst/clap/work/clapuncert/clap\_uncert.txt**

**Data used in clap\_uncert.R are in**

**/aer/doc/inst/clap/work/clapuncert/allcsv.zip**

**IDL script used to generate the figure is in**

**/aer/aeroclim/papers/johno/clap/plot\_contour\_big**

Figure 10: Comparison of attenuation coefficients measured with CLAP and PSAP at three stations (a) LLN, Mt. Lulin, Taiwan; (b) APP, Appalachian State University, Boone, NC, USA; (c) THD, Trinidad Head, CA, USA; (d) THD, blue wavelength. Results are for the red wavelength, except for (d). The shaded areas contain 90 % of the observations and the color shading distinguishes the deciles of the two-dimensional probability distribution function of the measurements. The orthogonal regression lines are shown in blue and the 1:1 line in gray. Slopes and intercepts of the orthogonal regression lines are included, along with their uncertainties (95 % confidence) and the number of hourly observations (N); the regression lines account for over 98 % of the variance in each data set.

**Code used to extract and process data from stations is in**

**/aer/work/derek\_work/clap\_psap\_v2/main.sh**

**Scripts used in above main.sh script are in**

**/aer/work/derek\_work/clap\_psap\_v2/code**

**Data processing summary and merged file of data from stations is in**

**/aer/work/derek\_work/clap\_psap\_v2/output\_20170426/intensives/README.txt /aer/work/derek\_work/clap\_psap\_v2/output\_20170426/intensives/all.csv**

**Data analysis of comparisons is in**

**/aer/work/derek\_work/clap\_psap\_v2/output\_20170426/johno/all.Rdata /aer/work/derek\_work/clap\_psap\_v2/output\_20170426/johno/data\_analysis.R /aer/work/derek\_work/clap\_psap\_v2/output\_20170426/johno/results.xlsx**

Figure 11: Slope of orthogonal regression line relating attenuation coefficients measured by CLAP vs. PSAP as a function of mean attenuation coefficient for 17 stations. The blue line indicates the median slope of 0.914. Data are given for all measured wavelengths.

**See documentation for Fig 10**

Table 3: Ratio of light attenuation coefficient measured with Azumi filter to the value measured with Pallflex filter.

**Calculations are documented in**

**/aer/doc/inst/clap/work/Azumi/bld2016/README\_bld.txt**

**/aer/doc/inst/clap/work/Azumi/gmd2015/README.txt**

**/aer/doc/inst/clap/work/Azumi/Pallflex-vs-Azumi.xlsx**