

# Overview of Existing VAPs related to ALWG interests

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# What is an “Ingest”? What is a “VAP”?

## ▶ Ingests

- Eat raw instrument data and produce netcdf files
- Run essentially autonomously, generally hourly

## ▶ VAP: Value-Added Product

- Accept one or more existing datastreams as input
- Adds additional “value”, generally new physical fields.
- Processing generally daily or slower

## ▶ Sometimes unclear whether a processing step should be applied during ingest or within with a VAP.

- Can it be applied in near-real time?
- Is the data still generally useful without it?
- Is it a calibration, correction, or a new physical parameter?
- How robust or mature is the processing?

# ALWG-related Data Product Families

- ▶ MFRSR/NIMFR Family
- ▶ AOS Family
- ▶ SGP TDMA + APS
- ▶ Raman Lidar Family
- ▶ Aerosol Best-Estimate

# MFRSR/NIMFR Family

- ▶ Data path:
  - Ingest applies corrections and nominal calcs
  - Langley VAP retrieves TOA reference
  - AOD VAP refines calibration, retrieves atmos. transmittance, aerosol optical depth, and angstrom exponent
- ▶ Data products:
  - AOD (cloud screened): 415, 500, 615, 673, 870 nm.
  - Angstrom exponent from 500 nm and 870 nm.
  - Atmospheric transmittance at 415, 500, 615, 673, 870 nm.
- ▶ Input data streams: MFRSR or NIMFR data files
- ▶ Availability:
  - Nominally calibrated by ingest: hourly
  - Langley: daily
  - AOD: 1-month delay

# AOS Family: AOS, AIP, fRH

## ▶ Data path

- AOS data collected
- Corrections, calcs applied (NOAA processing reproduced by ingest and AOS\_corr)
- AIP VAP computes Aerosol Intensive Properties
- fRH VAP computes hygroscopicity of scattering coefs.

## ▶ Data products: available daily at SGP and NSA

- 60-second
  - $B_{sp}$ ,  $B_{bsp}$ ,  $B_{ap}$  at low RH for nominal R,G,B wavelengths for alternating 1  $\mu$ m and 10  $\mu$ m impactor positions.
  - $\text{\AA}$  (for  $B_{sp}$ ,  $B_{bsp}$ ,  $B_{ap}$ ),  $\omega$ ,  $g$ ,  $bsf$ , for R,G,B, with 1  $\mu$ m and 10  $\mu$ m

# AOS Family: AOS, AIP, fRH

## ► Data products, continued:

### ■ 60-min:

- $B_{sp}$ ,  $B_{bsp}$ ,  $B_{ap}$  at low RH for nominal R,G,B wavelengths for alternating 1  $\mu\text{m}$  and 10  $\mu\text{m}$  impactor positions.
  - $\text{\AA}$  (for  $B_{sp}$ ,  $B_{bsp}$ ,  $B_{ap}$ ),  $\omega$ ,  $g$ ,  $bsf$ , for R,G,B, with 1  $\mu\text{m}$  and 10  $\mu\text{m}$
  - Sub-micron scattering and absorption fractions
  - $f(\text{RH})$  total scattering hygroscopicity 2-parameter and 3-parameter fits and resulting  $f(85\%/40\%)$  ratio for nominal R, G, B wavelengths and alternating size cuts
  - $f(\text{RH})$  back scattering hygroscopicity 2-parameter fit and resulting  $f(85\%/40\%)$  ratio for nominal R, G, B wavelengths and alternating size cuts
- All basically daily at SGP, NSA, (and AMF1?)
  - That's a lot, but what is missing? CCN and size distributions.

# SGP TDMA + APS

- ▶ Data path:
  - Raw data => PI (Don Collins) => XDC
- ▶ Data products:
  - Size distributions (DMA-only, APS-only, combined)
  - Size resolved hygroscopicity:  $g(\text{RH})$
  - CCN supersaturation spectrum 0-3%
- ▶ Input data streams
  - TDMA, HTDMA, APS raw data

# Raman Lidar Family

- ▶ Data path
  - Ingest converts raw lidar data to netcdf.
  - Several RL Prof routines generate distinct products below
- ▶ Data products:
  - aerosol scattering ratio and bscat coef profiles
  - aerosol extinction profiles and aerosol optical depth
  - water vapor mixing ratio and RH profiles, along with PWV
  - depolarization profiles and single layer cloud optical depths
  - Best-estimate state of the atmos. profiles from RL
- ▶ Availability: SGP,daily



# Aerosol Best-Estimate

- ▶ Data products:
  - AOD at 500 nm and 355 nm
  - Angstrom exponent from AOD
  - Vertical profiles of aerosol extinction, SSA, and  $g$
- ▶ Input data streams
  - NIMFR or MFRSR AOD
  - Surface met
  - Sondes (MergeSonde, LSSonde, sondewnpn,...)
  - RL Prof
  - AIP and fRH

# Aerosol Best-Estimate

## ► Details of algorithm

Designed for continuity temporally and vertically, so estimation methods are used to reduce or eliminate data gaps. Data is packaged into monthly files on fixed 10-minute time grid

### ■ AOD and Angstrom exponent

- Use NIMFR / MFRSR / RL if available within 3 hrs
- Else use multivariate regression below out to 8 hrs:

$$\blacklozenge \text{AOD} = a * \text{RH}_{bl} + b * \ln(\text{Bsp} * \text{RH}_{sfc}) + c * \text{RH}_{sfc}$$

### ■ Vertical profiles:

- Ext. profile from seasonal climatology (Turner, Ferrare, Brasseur 2001) of RL extinction profiles vs. AOD.
- Vertical profiles of ssa and g from abs coef and humidified scat coef at sfc

# Aerosol Best-Estimate

- ▶ Data availability:
- ▶ SGP: 2001 – 2007 at archive as eval product
- ▶ NSA: Jan 2004 – Feb 2005, at archive as eval product
  - **Jan-Dec 2008: reviewed, ready for release**
- ▶ Working toward an operational release including substantial QC.