Excerpt from: AERONET's Version 2.0 quality assurance criteria

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The following parameters compose the Version 2.0 suite of retrieval products:
- Particle Volume Size distribution in 22 size bins, Volume concentration (C_v), volume median radius (R_v), standard deviation and effective radius for total, fine and coarse modes
- % Spherical particles
- Spectral Complex Index of Refraction (real and imaginary),
- Spectral Phase function
- Spectral Asymmetry Parameter
- Spectral Extinction optical depth
- Spectral Absorption Optical Depth
- Spectral Single Scattering Albedo (ω_o)

Instantaneous:
- Spectral upward and downward fluxes (TOA and BOA*)
- Broadband upward and downward fluxes (TOA and BOA)
- Radiative forcing (TOA and BOA)
- Radiative forcing efficiency (TOA and BOA)

* TOA= Top of Atmosphere   BOA=Bottom of Atmosphere

VERSION 2.0 CONSTRAINTS ON THE INPUT DATA FOR LEVEL 2 INVERSIONS

AERONET input criteria were re-evaluated and updated to provide quality assured (Level 2) inversion products that are

table and physically realistic. The principle retrieval products evaluated are volume size distribution, R_v, C_v, and ω_o and to lesser extent real index of refraction, n. The input parameters include spectral AOD (Version 2, see AERONET webpage for details), surface albedo and the solar aureole/sky radiance measurements taken during almucantar scans.

Holben et al., 1998 reported the almucantar measurements for the Cimel Electronique CE 318 radiometer in azimuth angles reproduced in Table 1. That spectral measurement sequence (440 nm, 675 nm, 870 nm and 1020 nm) was a single counterclockwise sweep of predetermined azimuth angles that provided redundant observations at all azimuth angles except 180°. The sequence was revised in 1999 to streamline the observations and eliminate mechanical problems associated with a 360° rotation. The resulting clockwise and counter clockwise 180° scans also provided two observations at 180° azimuth allowing a more robust cloud screening check commensurate with the other angles. In 2002 AERONET began providing a quality assured Version 1.0 inversion product with the Dubovik and King, (2000) inversion (spherical model) and the Dubovik et al. 2002 spheroid inversions. The input criteria for these inversions were rather simple but poorly researched. Additional experience resulted in further Level 2 post processing criteria that are presented in Table 2.

Table 1, Almucantar azimuthal measurements are relative to the sun (0°). The combined measurements represent 360 K almucantars of which 253 K have Level 2 potential.

Year Implemented	Almucantar Azimuth Sequence	Potential # Version 2.0 level 2 Inversions	Comment
1993 to ~1999	0, -6 – A, -5, -4, -3.5, -3, -2.5, -2, 2, 2.5, 3, 3.5, 4, 5, 6 – A, 6 – K*, 7, 8, 10, 12, 14, 16, 18, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 120, 140, 160, 180, -160, -140, -120, -100, -90, -80, -70, -60, -50, -45, -40, -35, -30, -25, -20, -18, -16, -14, -12, -10, -8, -7, -6 – K, -6 – A, -5, -4, -3.5, -3, -2.5, -2, 2, 2.5, 3, 3.5, 4, 5, 6 – A*	46,000	Single 360 degree counterclockwise sweep; single measurement at 180° Azimuth angle; Approximate time for 4 λ sequence- 6 min.
~1999 to present	Counterclockwise sequence: 0, 3, 3.5, 4, 5, 6 – A, 6 – K, 7, 8,10, 12, 14, 16, 18, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 120, 140, 160,180 Clockwise sequence: 0, 3, 3.5, 4, 5, 6 – A, 6 – K, 7, 8,10, 12, 14, 16, 18, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 120, 140, 160,180	207,000	Clockwise and counter clockwise rotation, all azimuth angles taken twice for consistency check; Approximate time for 4 λ sequence: 5 min

*Note-'A' refers to the sun collimator optics and 'K' refers to the sky radiance collimator optics

Table 2 Pre and post processing criteria required for Version 1.0, Level 2 inversion products.

Inversion Parameter	Data Preparation/Level 1.5 Inversion Criteria	Additional Level 2 Inversion Criteria
All parameters	All 4 spectral bands (440, 675, 870, 1020 nm) required	
All parameters	Level 2 AOD; AOD measured within ±16 min of almucantar measurement and immediately preceding AOD must be present; 20% symmetry check for all angles,	
All parameters	All azimuth angles < 3.5° eliminated	
All parameters	Scattering angles: ≥ 10 scattering angles	21 azimuth angles from 0° to 160° scan must be included and spectrally coincident
All parameters-Spherical Model		5% residual
All parameters-Spheroid Model		10% residual
All parameters		$\Theta_0 > 50°$
ω_0, n, k		$\tau_{a440} > 0.40$

The Version 2.0 Level 2 pre and post criteria are presented in Table 3. These criteria are based on analyst's experience and a statistical analysis of the 360,000 almucantars. Some of the Version 1.0 criteria were retained, others modified and new criteria introduced to take better advantage of the new measurement sequence and further adapted to accommodate the old measurement sequence. Those criteria highlighted in Table 3 show the differences in the Version 2 criteria (compare to Table 2).

Table 3, Input data preparation and level 1.5 criteria, and Level 2 Inversion Criteria for Version 2.0 Inversion processing.

Aerosol Parameter affected	Data input Preparation/Level 1.5 inversion criteria	Additional Level 2 Inversion Criteria
All parameters	All 4 spectral bands (440, 675, 870, 1020 nm) required	
All parameters	Version 2 Level 2 AOD; AOD measured within ±16 min of almucantar measurement and AOD immediately preceding almucantar must be present; 20% agreement for sky radiance symmetry check for all angles except 180° azimuth (see next)	
All parameters	Dual 180° azimuth measurements (since ~1999): $\|\,(L^{\dagger}-R^{\dagger})/(L+R)/2\|\ \le 5\%$ Single 180 measurement prior to 1998: referenced to mean of 160° azimuth angle & passing angular radiance consistency check- $\|\,(160-180)/160\|\ \le\ 5\%$	
All parameters	Scattering angles: Select scattering angles $\ge 3.2°$ within each spectral almucantar; Remove all saturated or 0 value scattering angles	
All parameters	Scattering angles: ≥ 10 scattering angles and 1 angle in each angle range bin for each λ: $\ge$3.2 to 6.0: at least 1 in range $\ge$6.0 to 30.0: at least 1 in range $\ge$30.0 to 80: at least 1 in range $\ge$80.0: at least 1 in range	Minimum binned scattering angle requirements for each λ: $\ge$3.2 to 6.0: at least 2 in range $\ge$6.0 to 30.0: at least 5 in range $\ge$30.0 to 80: at least 4 in range $\ge$80.0: at least 3 in range
All parameters		Sky Residual errors as a function of τ_{a440}: 0 to 0.20: 5% $\ge$ 0.20 to 1.50: $Y = -1.09X^2 + 4.07X + 4.33$ Where x is τ_{a440} and Y=residual $\ge$1.50: 8%
All parameters except coarse mode size distribution		$\theta_o \ge 50°$; Dubovik et al., 2000
ω_0, n, k		$\tau_{a440} \ge 0.40$, Dubovik et al., 2000
% sphericity		$\tau_{a440} > 0.20$

[†]Note-L and R refer to the clockwise and counterclockwise almucantar scans.

For further information, please refer to the entire document:
http://aeronet.gsfc.nasa.gov/new_web/PDF/AERONETcriteria_final1.pdf