Almucantar Retrieval Inversion Products and Parameter Summary

1.0 INTRODUCTION

The AERONET download tool has become more complex with the addition of the new retrieval products and levels (Figure 1). A number of data products are provided with each almucantar retrieval (Table 1). This document summarizes the download for each retrieval product model type: Spherical, Spheroid, and Combined Spherical and Spheroid. Each section provides the parameters and data ranges (if any) for each possible level and data mode (default or user-defined parameters).

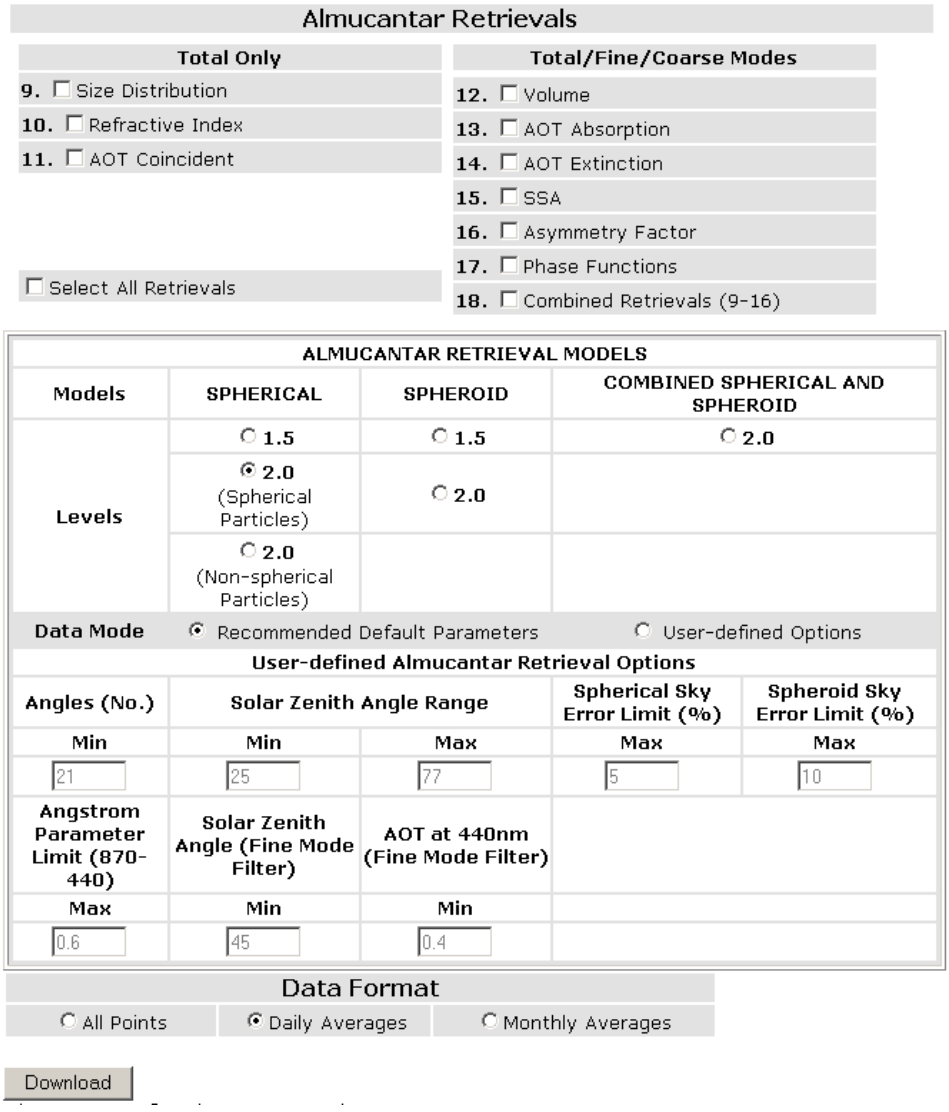

Figure 1 Snapshot of the AERONET Download Tool Retrieval Section

Table 1 A summary of the data products for each retrieval model.

Retrieval Data Products	Data Product Summary Information				
	Mode		Channels Provided		Description
	Total Only	Total/ Fine/ Coarse	1020, 870, 670, 440 nm	All Operational Channels (1640 to 340nm)	
Size Distribution	***Yes***	No	No (but used in calculation)	No	Derived aerosol size distribution
Refractive Index	***Yes***	No	***Yes***	No	Derived refractive index of the atmosphere (real and imaginary parts
AOT Coincident	***Yes***	No	No	***Yes***	Calculated by averaging the level 1.5 or 2.0 AOT data values (Level 2.0 has priority) ±16 minutes of the retrieval time (typically uses three to five AOT points for the coincident average).
Volume	No	***Yes***	No (but used in calculation)	No	Derived volume concentration, volume median radius, effective radius, standard deviation
AOT Absorption	No	***Yes***	***Yes***	No	Equation: (1-SSA)*AOT (where AOT is AOT Extinction) - The single scattering albedo is used for each incidence of a retrieval. The AOT is calculated by adding the derived retrieval AOT fine and coarse modes.
AOT Extinction	No	***Yes***	***Yes***	No	Derived values for AOT from retrieval. The total mode is determined by the sum of the fine and coarse modes.
Single Scattering Albedo	No	***Yes***	***Yes***	No	Derived single scattering albedo
Asymmetry Factor	No	***Yes***	***Yes***	No	Integrated value for phase functions
Phase Functions (all points data format only)	No	***Yes***	***Yes***	No	Derived phase functions.
Combined Retrievals	No	***Yes***	Depends on product	AOT Coincident only	Combination of all retrieval products except phase functions.

Note: Please refer to Section 6.0 for more information on the spherical and spheroid models and associated retrieval products.

2.0 SPHERICAL MODEL

The Spherical Model provides Levels 1.5, 2.0 (Spherical Particles), and 2.0 (Non-spherical Particles) data.

Table 2 shows the relationship between the default parameters and Spherical model levels. Table 3 shows the relationship between the user-defined parameters and Spherical model levels.

Table 2 Default parameters used in the Spherical model.

Default Parameters	SPHERICAL Retrieval Inversion Model					
	1.5		2.0 (Spherical Particles)		2.0 (Non-spherical Particles)	
	Applied?	Condition	Applied?	Condition	Applied?	Condition
AOT Level 1.5	***Yes***	No Limit	No		No	
AOT Level 2.0	***Yes***	No Limit	***Yes***	No limit	***Yes***	No limit
Solar Zenith Angle	No		***Yes***	>25º	***Yes***	>25º
Number of Symmetric Angles	***Yes***	>10	***Yes***	>20	***Yes***	>20
Sky Error	No		***Yes***	≤5%	***Yes***	>5% & ≤ 15%
870-440 Angstrom Parameter	No		No		***Yes***	<0.6
Tails Ends (Tail Screening Condition 1)	***Yes***	Value of smallest or largest size distribution bin ≤50% of value of the maximum value of the entire size distribution, then retrieval is valid	***Yes***	Value of smallest or largest size distribution bin ≤50% of value of the maximum value of the entire size distribution, then retrieval is valid	***Yes***	Value of smallest or largest size distribution bin ≤50% of value of the maximum value of the entire size distribution, then retrieval is valid
Tails Difference (Tail Screening Condition 2)	***Yes***	If the difference in tail value minus adjacent bin value is ≤30% of the maximum value of the entire size distribution, then retrieval is valid	***Yes***	If the difference in tail value minus adjacent bin value is ≤30% of the maximum value of the entire size distribution, then retrieval is valid	***Yes***	If the difference in tail value minus adjacent bin value is ≤30% of the maximum value of the entire size distribution, then retrieval is valid

Table 3 User-defined parameters for the Spherical Model.

User-Defined Parameters	SPHERICAL Retrieval Inversion Model					
	1.5		2.0 (Spherical Particles)		2.0 (Non-spherical Particles)	
	Available?	Range	Available?	Range	Available?	Range
Number of Symmetric Angles	No		***Yes***	>10 & <29	***Yes***	>10 & < 29
Minimum Solar Zenith Angle	No		***Yes***	>25º & < maximum solar zenith angle	***Yes***	>25º & < maximum solar zenith angle
Maximum Solar Zenith Angle	No		***Yes***	> minimum solar zenith angle & <77º	***Yes***	> minimum solar zenith angle & <77º
Spherical Sky Error Limit	No		***Yes***	>0% & <15%	***Yes***	>0% & <15%
Spheroid Sky Error Limit	No		No		No	
870-440 Angstrom Parameter	No		No		***Yes***	>0 & <2.0
Solar Zenith Angle (Fine Mode Filter)	No		***Yes***	>25 & < solar zenith maximum	***Yes***	>25 & < solar zenith maximum
AOT at 440nm (Fine Mode Filter)	No		***Yes***	>0 & < 10	***Yes***	>0 & <10

*Note: Tail Screening 1 and 2 (Table 2) will be applied to all retrievals and cannot be modified by the download tool.

3.0 SPHEROID MODEL

The Spheroid Model provides Levels 1.5 and 2.0 data.

Table 4 shows the relationship between the default parameters and Spheroid model levels. Table 5 shows the relationship between the user-defined parameters and Spheroid model levels.

Table 4 Default parameters used for the Spheroid model.

Default Parameters	SPHEROID Retrieval Inversion Model			
	1.5		2.0	
	Applied?	Condition	Applied?	Condition
AOT Level 1.5	***Yes***	No Limit	No	
AOT Level 2.0	***Yes***	No Limit	***Yes***	No limit
Solar Zenith Angle	No		***Yes***	>25º
Number of Symmetric Angles	***Yes***	>10	***Yes***	>20
Sky Error	No		***Yes***	<10%
870-440 Angstrom Parameter	No		***Yes***	<0.6
Tails Ends (Tail Screening Condition 1)	***Yes***	Value of smallest or largest size distribution bin ≤50% of value of the maximum value of the entire size distribution, then retrieval is valid	***Yes***	Value of smallest or largest size distribution bin ≤50% of value of the maximum value of the entire size distribution, then retrieval is valid
Tails Difference (Tail Screening Condition 2)	***Yes***	If the difference in tail value minus adjacent bin value is ≤30% of the maximum value of the entire size distribution, then retrieval is valid	***Yes***	If the difference in tail value minus adjacent bin value is ≤30% of the maximum value of the entire size distribution, then retrieval is valid

*Note: The Tail Screening Conditions 1 and 2 are identical to the Spherical model in Table 2.

Table 5 User-defined parameters for the Spheroid model.

User-Defined Parameters	SPHEROID Retrieval Inversion Model			
	1.5		2.0	
	Available?	Range	Available?	Range
Number of Symmetric Angles	No		***Yes***	>10 & < 29
Minimum Solar Zenith Angle	No		***Yes***	>25º & < maximum solar zenith angle
Maximum Solar Zenith Angle	No		***Yes***	> minimum solar zenith angle & <77º
Spherical Sky Error Limit	No		No	
Spheroid Sky Error Limit	No		***Yes***	>0% & <15%
870-440 Angstrom Parameter	No		***Yes***	>0 & <2.0
Solar Zenith Angle (Fine Mode Filter)	No		No	
AOT at 440nm (Fine Mode Filter)	No		No	

*Note: Tail Screening 1 and 2 (Table 2) will be applied to all retrievals and cannot be modified by the download tool.

4.0 Combined SPHERICAL and SPHEROID Models

The combined Spherical and Spheroid Model only provides Level 2.0 data. The Spherical model uses the default parameters shown in Table 2 and the Spheroid model uses the default parameters show in Table 4. In addition, the Level 2.0 Combined Spherical and Spheroid data download option uses the following procedure:

- If Level 2.0 Spherical model data is available, then the Spherical model is used for the instance in time.
- Otherwise, if Level 2.0 Spheroid model data is available, then the Spheroid model is used for the instance in time.
- Lastly, if none of the data are Level 2.0 for the instance in time, then the Level 2.0 data are not available for the instance in time.

Table 6 shows the relationship between the user-defined parameters and combined Spherical and Spheroid model.

Table 6 User-defined parameters for the combined Spherical and Spheroid model.

User-Defined Parameters	Combined SPHERICAL and SPHEROID Retrieval Inversion Model	
	2.0	
	Available?	Range
Number of Symmetric Angles	***Yes***	>10 & < 29
Minimum Solar Zenith Angle	***Yes***	>25º & < maximum solar zenith angle
Maximum Solar Zenith Angle	***Yes***	> minimum solar zenith angle & <77º
Spherical Sky Error Limit	***Yes***	>0% & <15%
Spheroid Sky Error Limit	***Yes***	>0% & <15%
870-440 Angstrom Parameter	***Yes***	>0 & <2.0
Solar Zenith Angle (Fine Mode Filter)	No	
AOT at 440nm (Fine Mode Filter)	No	

*Note: Tail Screening 1 and 2 (Table 2) will be applied to all retrievals and cannot be modified by the download tool.

5.0 REFERENCES

- Dubovik, O., B.N.Holben,T. Lapyonok, A.Sinyuk, M. I. Mishchenko, P. Yang, and I.Slutsker, 2002: Non-spherical aerosol retrieval method employing light scattering by spheriods,Geophys. Res. Lett., 29, 54-1 - 54-4. (PDF) | (TXT)
- Dubovik, O. and M. D. King, 2000: A flexible inversion algorithm for retrieval of aerosol optical properties from Sun and sky radiance measurements, J. Geophys. Res., 105, 20 673-20 696. (PDF) | (TXT)
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