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MISR Multi-angle Imaging Spectro-Radiometer

Data Product Specification for the MISR Level 2 Aerosol Product

-Incorporating the Science Data Processing Interface Control Document

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To determine the latest released version of this document, consult the MISR web site (http://misr.jpl.nasa.gov).

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Document Change Log

Revision	Date	Affected Portions and Description
	January 25, 2018	All, original release

Which Product Versions Does this Document Cover?

Product Filename Prefix	**Version Number in Filename**	**Brief Description**
MISR_AM1_AS_AEROSOL	F13_0023	Level 2 Aerosol

Table of Contents

1 INTRODUCTION

1.1 MISR LEVEL 2 AEROSOL PRODUCT

The Multi-angle Imaging SpectroRadiometer (MISR) Level 2 Aerosol products contain information on retrieved aerosol column amount, aerosol particle properties, and ancillary information based on Level 1B2 geolocated radiances observed by MISR from the National Aeronautics and Space Administration (NASA) Terra Earth Observing System (EOS) satellite, which has been operational since early 2000. These data are reported for each Terra orbit on a Space Oblique Mercator (SOM) reference grid, with 4.4 km × 4.4 km spatial sampling. Files are distributed in NetCDF-4 format, which is designed to be interoperable with HDF5.

The purpose of this document is to describe the format and contents of the MISR Level 2 Aerosol product. The full details of the other MISR standard products, as well as the ancillary datasets used in their generation, can be found in their respective MISR Data Product Specifications Documents (and, for earlier versions of the products, in the MISR Data Products Specifications Document, Rev. S). Information concerning the MISR georegistration is contained in the MISR Science Data Product Guide. The Aerosol product is distributed with a ***Data Quality Statement*** that summarizes the strengths and known limitations of the product, and is an essential complement to the current document for scientific users of the data.

1.2 MISR DATA PRODUCTS

The MISR project is a component of the EOS Terra Mission and the EOS Data and Information System (EOSDIS), which are components of NASA's Earth Science Enterprise. An integral part of the MISR project is the Science Data Processing (SDP) of the observations coming from the MISR instrument on-board the EOS Terra satellite.

MISR SDP exists to produce science and supporting data products from MISR instrument data. All functions of the MISR SDP system are directed toward this goal. MISR SDP does not operate as an independent entity, but rather is linked to the functionality of the EOSDIS at the Langley Research Center (LaRC) Distributed Active Archive Center (DAAC). The EOSDIS Core System (ECS) ingest subsystem at the LaRC DAAC is the agent for receiving and organizing all of the input data needed by MISR SDP. These data are then made available to MISR SDP through the data server and staging facilities provided by ECS at the LaRC DAAC. After MISR standard data processing is complete, the standard output products are archived through the EOSDIS data server and made available to users through ECS client services.

The MISR Science Computing Facility (SCF) at the Jet Propulsion Laboratory (JPL) supports the development of MISR science algorithms and software, instrument calibration and performance assessment, as well as providing quality assessment and data validation services with respect to MISR SDP. The MISR SCF is used to produce software, supporting data, and coefficients that are required to operate MISR SDP software at the LaRC DAAC. Additional algorithm development, calibration, and validation support for the Aerosol product is provided by the Climate & Radiation Laboratory at the NASA Goddard Space Flight Center (GSFC).

MISR SDP depends upon the availability of MISR instrument data, internal data sets produced at the MISR SCF, and external data sets that are products of other EOS data processing systems.

1.3 CONTROLLING DOCUMENTS

1) MISR Data System Science Requirements, JPL D-11398, September 1996 (or latest version).
2) MISR Level 1 Radiance Scaling and Conditioning Algorithm Theoretical Basis, JPL D-11507, Revision D, January 1999 (or latest version).
3) MISR Level 1 Georectification and Registration Algorithm Theoretical Basis, JPL D-11532, Revision D, November 1999 (or latest version).
4) MISR Level 1 Cloud Detection Algorithm Theoretical Basis, JPL D-13397, Revision A, November 1997 (or latest version).
5) MISR Level 1 In-flight Radiometric Calibration and Characterization Algorithm Theoretical Basis, JPL D-13398, June 1996 (or latest version).
6) MISR Level 1 Ancillary Geographic Product Algorithm Theoretical Basis, JPL D-13400, Revision B, March 1999 (or latest version).
7) MISR Level 2 Aerosol Retrieval Algorithm Theoretical Basis, JPL D-11400, Revision G, March 2008 (or latest version).
8) MISR Level 2 Ancillary Products and Datasets Algorithm Theoretical Basis, JPL D-13402, Revision A, December 1998 (or latest version).
9) MISR Science Data Product Guide, JPL D-73355, April 2012 (or latest version).

1.4 APPLICABLE DOCUMENTS

10) SDP Toolkit Users Guide for the ECS Project, HAIS 194-809-SD4-001 (or latest version)

2 MISR LEVEL 2 AEROSOL DATA PRODUCT SPECIFICATION

2.1 MISR LEVEL 2 AEROSOL PRODUCT FILE NAMES

MISR Level 2 Aerosol Products are composed of one of the two file types listed below (Table 1).

Table 1 – MISR Level 2 Aerosol Product File Names

MISR Aerosol Product Granule Name[1]	ESDT Name
MISR_AM1_AS_AEROSOL_ Pppp_Oooooo_Fff_vvvv.nc	MIL2ASAE
MISR_AM1_AS_AEROSOL_FIRSTLOOK_Pppp_Oooooo_Fff_vvvv.nc	MIL2ASAF

2.2 MISR LEVEL 2 AEROSOL PRODUCT FILE BRIEF DESCRIPTION

The MISR Aerosol Product Generation Executable (PGE) 9a provides for the end-to-end generation of the MISR Level 2 Aerosol Product. This section gives a brief summary of the approach. For more detailed information please refer to the MISR Level 2 Aerosol Retrieval Algorithm Theoretical Basis Document (ATBD).

Initially, MISR Level 1B2 instrument data samples from all nine cameras and four spectral bands are averaged to the 1.1 km × 1.1 km (subregional) resolution required by the Aerosol algorithm. The averaged top-of-atmosphere (TOA) radiances are then normalized to an Earth-Sun distance of 1 astronomical unit (AU), converted to equivalent reflectances, corrected for out-of-band effects – including veiling light – and corrected for ozone absorption. The 1.1 km × 1.1 km subregions are then screened for contamination from sources such as clouds, sun glint over water, shallow water, and topographically complex terrain.

Next, the corrected equivalent reflectances from selected subregions contained within each 4.4 km × 4.4 km region are compared to modeled equivalent reflectances in the Simulated MISR Ancillary Radiative Transfer (SMART) look up table (LUT) to retrieve the atmospheric aerosol properties. The LUT equivalent reflectances correspond to various aerosol types and amounts, sun and view geometries, and surface types. A subset of the SMART models is selected based on appropriate geometric and surface type conditions for each comparison.

[1] Where ppp is the three-digit path number (001 to 233), oooooo is the six-digit orbit number, ff is the two-digit file format version (13 for this version), and vvvv is the four-digit version number (0023 for this version).

Over Dark Water regions the algorithm attempts to determine the appropriate near-surface wind conditions using the angular pattern of the observed sun glint. If this is not possible given the specific viewing geometry for a particular location, then the algorithm defaults to the climatological monthly mean near-surface wind contained in the Terrestrial Atmosphere and Surface Climatology (TASC) dataset. After choosing the most appropriate lower boundary condition, the algorithm then calculates the goodness of fit based on a least squares approach and finds the range of acceptable aerosol optical depths (AODs) for each model. The most likely total column aerosol optical depth and best fitting aerosol model are reported in the product, along with the range of acceptable AODs, which is designated as the retrieval "uncertainty."

For Heterogeneous Land surfaces a different algorithm is applied that uses the variability of the surface reflectance to separate the contributions of the surface and atmosphere to the observed TOA equivalent reflectances. First, view-angle-dependent empirical orthogonal functions (EOFs), computed from the corrected MISR subregional equivalent reflectances, are used in an expansion of the surface-reflected component of the TOA equivalent reflectances. This expansion term plus the modeled atmospheric path equivalent reflectances (i.e., TOA equivalent reflectances for a black surface from the SMART) are then compared to the MISR TOA equivalent reflectances. The aerosol model that results in the lowest residual, based on a least squares determination of the EOF coefficients in the expansion term, is assumed to provide the column aerosol parameters that best characterize the region. A relative threshold on this minimum residual fit also determines the range of acceptable AODs, and the standard deviation of the AODs within this range is designated as the retrieval "uncertainty."

2.3 DIFFERENCES BETWEEN FIRSTLOOK AND FINAL PROCESSING

The MISR processing stream has been split into two parts – "FIRSTLOOK" and "FINAL" – to accommodate the time dependence of the TASC and Radiometric Camera-by-camera Cloud mask Threshold (RCCT) ancillary datasets. The TASC contains snow-ice coverage and mean near-surface wind speed values that are updated on a monthly basis. The RCCTs are updated based on observations within a 3-month period. Rather than delaying processing of all MISR Level 2 and Level 3 data until these datasets are available, FIRSTLOOK products are generated using the TASC from the same month for the previous year and the RCCT from the same season in the previous year. When the updated TASC and RCCT datasets become available, FINAL processing is run. The FIRSTLOOK products are distinguished by the presence of FIRSTLOOK in the filenames, whereas FINAL products do not include any such designation (see Table 1).

2.4 FILE CONTENT DESCRIPTION

Content within each product file is organized as a hierarchy of groups, beginning with a top-level group, designated by the slash symbol (/). Each group can contain attributes, dimensions, fields, or other groups. Table 2 gives an overview of all groups with cross-references to subsequent tables describing the content of each group. Individual dimensions and fields can also contain attributes where applicable. The set of possible attributes for individual fields and dimensions is summarized in Table 12.

Table 2 – Overview of File Content

Group Name (parent group)	**Description**	**Cross-References**
/	Top-level group, containing file attributes.	Table 3 and Table 4 (file attributes)
4.4_KM_PRODUCTS (/)	Contains the data products most likely to be of wide interest to the user community. These products are reported on a 4.4 km × 4.4 km spatial resolution grid along with latitude, longitude, and time information. Content at this level represents the retrievals assessed as having the highest quality with strict cloud screening applied.	Table 5 (attributes) Table 6 (dimensions) Table 7 (fields)
AUXILIARY (4.4_KM_PRODUCTS)	Contains raw data products, allowing more sophisticated analysis of the MISR aerosol algorithm performance and results. Provides ancillary information on boundary conditions, screening flags, and the full set of retrievals regardless of quality (indicated by the "_Raw" suffix). ***Users are cautioned to only use these fields with an appropriate understanding of their contents.*** Products in the parent (4.4_KM_PRODUCTS) group can be used with greater confidence, and it is likely that those fields are sufficient for most research purposes.	Table 5 (attributes) Table 6 (dimensions) Table 8 (fields)
GEOMETRY (4.4_KM_PRODUCTS)	Contains sun-satellite viewing geometry used for each retrieval. To conserve space, some products are scaled to integer type, using a scale factor and offset. Note that MISR reports zenith and azimuth geometry following the direction of photon travel, which may lead to unexpected results if not properly taken into account. See Figure 36 of controlling document [3] (JPL D-11532) for MISR definitions of sun and view angles.	Table 5 (attributes) Table 6 (dimensions) Table 9 (fields)
METADATA (/)	Container for subgroups only.	
COMPONENT PARTICLE INFORMATION (METADATA)	Replicates information about the MISR aerosol component particles from the Aerosol Physical and Optical Properties (APOP) file that is part of the Aerosol Climatology Product (ACP). Note that not all the aerosol models described in the group are used in the current MISR Level 2 Aerosol operational retrievals.	Table 10
MIXTURE_INFORMATION (METADATA)	Replicates information about MISR aerosol mixtures from the ACP. All of these aerosol mixtures are used in the current MISR Level 2 Aerosol operational retrievals.	Table 11
HDFEOS INFORMATION (/)	Contains ECS Inventory Metadata, used by the DAAC, for ingesting, cataloging, and searching data products.	

Table 3 – NetCDF Climate and Forecast (CF) Standard File Attributes

Attribute Name	Value
title	MISR Level 2 Aerosol Product
institution	MISR Level 2 Aerosol Products are produced by the MISR Science Team using processing and storage facilities of the NASA Langley Research Center DAAC.
source	Aerosol retrievals are obtained by fitting radiometric observations from the MISR instrument to modeled equivalent reflectances from the Simulated MISR Ancillary Radiative Transfer (SMART) lookup table.
history	<*date*> : Initial production using software version <*version tag*>, built <*build date*>, by <*user id*>. See also Software_version_information and Input_files.
references	Data Product Specifications and Algorithm Theoretical Basis Documents are available from the Langley Atmospheric Science Data Center at https://eosweb.larc.nasa.gov/project/misr/misr_table.
Conventions	CF-1.6

Table 4 – File Attributes

Attribute Name	Definition	Data Type	Units	Valid Range
Path_number	Path number of the SOM projection for this Terra orbit	32-bit integer	n/a	1 to 233
AGP_version_id	Version identifier for Ancillary Geographic Product (AGP)	32-bit integer	n/a	2
DID_version_id	Version identifier for the Digital Terrain Elevation Dataset (DTED) Intermediate Dataset (DID)	32-bit integer	n/a	4
Number_blocks	Total number of blocks	32-bit integer	n/a	1 to 180
Ocean_blocks_size Ocean_blocks.count Ocean_blocks.numbers	List of MISR blocks containing only ocean surface type in the AGP	32-bit integer	n/a	1 to 180
SOM_parameters.[*] (1) som_ellipsoid_a (2) som_ellipsoid_e2 (3) som_orbit.aprime (4) som_orbit.eprime (5) som_orbit.gama (6) som_orbit.nrev (7) som_orbit.ro (8) som_orbit.i (9) som_orbit.P2P1 (10) som_orbit.lambda0	SOM map projection parameters for X, Y gridded data in this file. Alternate format of the same information given in Table 5, GCTP projection parameters. (1) Semi-major axis of ellipsoid (WGS84) in meters (2) Eccentricity of ellipsoid squared (3) Not used (4) Not used (5) Not used (6) Number revolutions per ground track repeat cycle (7) Radius of circular orbit in meters (8) Orbit inclination in radians (9) Ratio of time of revolution per orbit to the length of Earth rotation (10) Longitude of ascending orbit at equator (λ_0), in radians, $\lambda_0 = \lambda_{ref} - \frac{2\pi}{233} \cdot path\_number$ $\lambda_{ref} = 129.3056 \cdot \frac{\pi}{180}$	64-bit float, 32-bit integer	meters, radians, n/a	(1) 6378137.0 meters (2) 0.006694348 (3) 1.0 (4) 1.0 (5) 1.0 (6) 233 (7) 7078040.8 meters (8) 1.715725326 radians (9) 0.068666667 (10) 0 to -2π radians
Cam_mode	Indicates whether the data in this file was obtained in MISR global mode or local mode	32-bit integer	n/a	0 = local 1 = global
Num_local_modes	Number of MISR local mode acquisitions contained in this file	32-bit integer	n/a	0 to 6 0 if data is global mode

Table 4 – File Attributes

Local_mode_site_name	Geographical name of the first local mode site contained in this file (if applicable)	String	n/a	
Orbit_QA	Indication of the overall quality of the orbit data, based on analysis of quality flags in the spacecraft attitude and ephemeris data. Geolocation accuracy may be impaired for orbits with poor quality orbit data.	32-bit float	n/a	-9999.0 = No retrieval -1.0 = Poor 0.0 = Nominal
SOM_map_minimum_corner.x SOM_map_maximum_corner.x SOM_map_minimum_corner.y SOM_map_maximum_corner.y	Map corner coordinates of SOM projection for X, Y gridded data in this file. X axis increases with time along the spacecraft ground track. Y axis increases with sample number, perpendicular to the ground track. See Table 5, GCTP_projection parameters.	64-bit float	meters	X: 6 million to 33 million Y: -12 million to 12 million
Start_block End_block	MISR block numbers corresponding to the first and last blocks processed for this product	32-bit integer	n/a	1 to 180 (Start_block ≤ End_block)
Local_granule_id	Name of this file	String	n/a	
Local_version_id	Software version identifier	String	n/a	
PGE_version	Version of the PGE used to generate this file	String	n/a	
Equator_crossing_longitude Equator_crossing_time Range_beginning_time Range_ending_time	Alternate source of the same named parameters in ECS inventory metadata. These are only provided for convenience of access to inventory metadata elements and should not be used as precise measurements relative to aerosol retrievals. See Time field (Table 7) for sources of time information.	64-bit float String	degrees	longitude: -180 to +180 time: ISO 8601 format, e.g. 2004-06-30T21:17:11.711120Z
Orbit_number	Terra orbit number	32-bit integer	n/a	
Software_version_information	Software version information	String	n/a	
Software_version_tag	Tag identifying software version	String	n/a	
Software_build_date	Date and time of software build	String	n/a	ISO 8601 format, e.g. 2017-03-07T00:07:01Z
Input_files	List of input files used in data processing	String	n/a	
config.[*]	Configurable parameters used for this product version	String		

Table 5 – 4.4_KM_PRODUCTS Attributes

Attribute Name	Definition	Data Type	Units	Valid Range
GCTP projection parameters	SOM projection parameters represented as a 13-parameter array, compatible with the General Cartographic Transformation Package (GCTP), SOM A (code 22) format, detailed in the HDF-EOS User's Guide. Relevant parameters are: (1) Semi-major axis of ellipsoid (WGS84) (2) Eccentricity of ellipsoid squared (expressed as a negative value) (4) Inclination of orbit at ascending node (packed degrees minutes seconds (DMS) format) (5) Longitude of ascending orbit at equator (packed DMS format). See Table 4, SOM_parameters, λ_0 (9) Orbit period in minutes Parameters 3, 6 through 8, and 10 through 13 are always zero.	64-bit float	meters, degrees, minutes	(1) 6378137.0 meters (2) -0.006694348 (3) 0 (4) 98018013.75 (5) 0 to 360 degrees (6) 0 (7) 0 (8) 0 (9) 98.88 minutes (10) 0 (11) 0 (12) 0 (13) 0
block_size_in_lines	Size of a MISR block on the SOM X axis (along-track)	32-bit integer	lines	32
block_size_in_samples	Size of a MISR block on the SOM Y axis (across-track)	32-bit integer	samples	128
resolution_in_meters	Resolution of this grid	32-bit integer	meters	4400

Table 6 – 4.4_KM_PRODUCTS Dimensions

Dimension Name *[CF standard_name]*	**Description**	**Data Type**	**Units**	**Valid Range**
X_Dim *[projection_x_coordinate]*	SOM projection X axis (along-track)	64-bit float	meters	6 million to 33 million
Y_Dim *[projection_y_coordinate]*	SOM projection Y axis (across-track)	64-bit float	meters	-12 million to 12 million
Block_Number	MISR block number	32-bit integer	n/a	1 to 180
Camera_Dim	Camera dimension in the order of acquisition by the instrument	32-bit integer	n/a	1 = D forward 2 = C forward 3 = B forward 4 = A forward 5 = A nadir 6 = A afterward 7 = B afterward 8 = C afterward 9 = D afterward
Mixture_Dim	Aerosol mixture number	32-bit integer	n/a	1 to 74
Spectral_AOD_Scaling_Coeff_Dim	Coefficient number	32-bit integer	n/a	1 to 3

Table 7 – 4.4_KM_PRODUCTS Fields

Field Name *[CF standard_name]* Parameter Description	**Dimensions**	**Data Type**	**Units**	**Flag Values**
Block_Start_X_Index Offset of first line on SOM x-axis (along-track)	Block	32-bit integer	n/a	
Block_Start_Y_Index Offset of first sample on SOM y-axis (across-track)	Block	32-bit integer	n/a	
Time *[time]* Approximate nadir view acquisition time in seconds since epoch, given by units (See Table 12, calendar). Accuracy of ±30 seconds can be assumed. More precise time information can be obtained from other sources.†	X	64-bit float	seconds since epoch	
Latitude *[latitude]* Geodetic latitude of retrieval	X, Y	32-bit float	degrees north	-9999.0 = Fill

Table 7 – 4.4_KM_PRODUCTS Fields

Longitude *[longitude]* Geodetic longitude of retrieval	X, Y	32-bit float	degrees east	-9999.0 = Fill
Elevation *[surface height above reference ellipsoid]* Surface elevation relative to the WGS84 ellipsoid	X, Y	16-bit integer	meters	-9999.0 = Fill
Year Calendar year of the acquisition (UTC)	X, Y	16-bit unsigned integer	n/a	65533 = Fill e.g., 2007
Day_Of_Year Calendar day number of the acquisition (UTC). Starts at 1 on January 1	X, Y	16-bit unsigned integer	n/a	65533 = Fill 1 to 366
Month Calendar month of the acquisition (UTC)	X, Y	8-bit unsigned integer	n/a	253 = Fill 1 to 12
Day Calendar day of month of the acquisition (UTC)	X, Y	8-bit unsigned integer	n/a	253 = Fill 1 to 31
Hour Hour of the acquisition (UTC)	X, Y	8-bit unsigned integer	n/a	253 = Fill 0 to 23
Minute Minute of the acquisition (UTC). Value is rounded down to next whole integer minute (e.g., 3 minute, 54 seconds is reported as 3). Represents the same time reference as the Time variable (described above)	X, Y	8-bit unsigned integer	n/a	253 = Fill 0 to 59
Land_Water_Retrieval_Type Indicator if successful retrieval was performed using the Land (Het Surf) or Water (Dark Water) algorithm	X, Y	8-bit unsigned integer	n/a	0 = Dark Water 1 = Het Surf 253 = Fill
Aerosol_Optical_Depth *[atmosphere optical thickness due to ambient aerosol particles]* AOD reported at 550 nm. May be reported without other aerosol particle properties[§]	X, Y	32-bit float	n/a	-9999.0 = Fill
Aerosol_Optical_Depth_Uncertainty Range of acceptable AODs reported at 550 nm	X, Y	32-bit float	n/a	-9999.0 = Fill
Angstrom_Exponent_550_860nm *[angstrom exponent of ambient aerosol in air]* Ångström exponent calculated using the AODs at 550 and 860 nm	X, Y	32-bit float	n/a	-9999.0 = Fill

Table 7 – 4.4_KM_PRODUCTS Fields

Spectral_AOD_Scaling_Coeff Spectral AOD scaling coefficients: parameters of a second order polynomial fit to the spectral AODs such that $AOD(\lambda) = c_1 \lambda^2 + c_2 \lambda + c_3$, where λ is the wavelength in μm ‡	X, Y, Spectral AOD Scaling Coeff	32-bit float	n/a	-9999.0 = Fill
Absorption_Aerosol_Optical_Depth *[atmosphere absorption optical thickness due to ambient aerosol particles]* AOD × (1-SSA) reported at 550 nm, where SSA is retrieved single scattering albedo at 550 nm. Requires successful Lowest Residual Mixture retrieval§	X, Y	32-bit float	n/a	-9999.0 = Fill
Nonspherical_Aerosol_Optical_Depth *[atmosphere optical thickness due to nonspherical ambient aerosol particles]* AOD fraction at 550 nm due to nonspherical aerosols. Requires successful Lowest Residual Mixture retrieval§	X, Y	32-bit float	n/a	-9999.0 = Fill
Small_Mode_Aerosol_Optical_Depth *[atmosphere optical thickness due to small mode ambient aerosol particles]* AOD fraction at 550 nm due to small mode aerosols (particle radius < 0.35 μm). Requires successful Lowest Residual Mixture retrieval§	X, Y	32-bit float	n/a	-9999.0 = Fill
Medium_Mode_Aerosol_Optical_Depth *[atmosphere optical thickness due to medium mode ambient aerosol particles]* AOD fraction at 550 nm due to medium mode aerosols (particle radius 0.35 – 0.7 μm). Requires successful Lowest Residual Mixture retrieval§	X, Y	32-bit float	n/a	-9999.0 = Fill
Large_Mode_Aerosol_Optical_Depth *[atmosphere optical thickness due to large mode ambient aerosol particles]* AOD fraction at 550 nm due to large mode aerosols (particle radius > 0.7 μm). Requires successful Lowest Residual Mixture retrieval§	X, Y	32-bit float	n/a	-9999.0 = Fill

Table 8 – AUXILIARY Fields (4.4 KM PRODUCTS)

Field Name *[CF standard_name]* Parameter Description	**Dimensions**	**Data Type**	**Units**	**Flag Values**
Land_Water_Retrieval_Type_Raw Indicator whether retrieval was performed using the Land (Het Surf) or Water (Dark Water) algorithm	X, Y	8-bit unsigned integer	n/a	0 = Dark Water 1 = Het Surf 253 = Fill
Aerosol_Optical_Depth_Raw *[atmosphere optical thickness due to ambient aerosol particles]* AOD reported at 550 nm. May be reported without other aerosol particle properties.[§]	X, Y	32-bit float	n/a	-9999.0 = Fill
Aerosol_Optical_Depth_Uncertainty_Raw Range of acceptable AODs reported at 550 nm	X, Y	32-bit float	n/a	-9999.0 = Fill
Angstrom_Exponent_550_860nm_Raw *[angstrom exponent of ambient aerosol in air]* Ångström exponent calculated using the AODs at 550 and 860 nm	X, Y	32-bit float	n/a	-9999.0 = Fill
Spectral_AOD_Scaling_Coeff_Raw Spectral AOD scaling coefficients: parameters of a second order polynomial fit to the spectral AODs such that $AOD(\lambda) = c_1 \lambda^2 + c_2 \lambda + c_3$, where λ is the wavelength in μm [‡]	X, Y, Spectral AOD Scaling Coeff	32-bit float	n/a	-9999.0 = Fill
Absorption_Aerosol_Optical_Depth_Raw *[atmosphere absorption optical thickness due to ambient aerosol particles]* AOD × (1-SSA) reported at 550 nm. Requires successful Lowest Residual Mixture retrieval[§]	X, Y	32-bit float	n/a	-9999.0 = Fill
Nonspherical_Aerosol_Optical_Depth_Raw *[atmosphere optical thickness due to nonspherical ambient aerosol particles]* AOD fraction at 550 nm due to nonspherical aerosols. Requires successful Lowest Residual Mixture retrieval[§]	X, Y	32-bit float	n/a	-9999.0 = Fill
Small_Mode_Aerosol_Optical_Depth_Raw *[atmosphere optical thickness due to small mode ambient aerosol particles]* AOD fraction at 550 nm due to small mode aerosols (particle radius < 0.35 μm). Requires successful Lowest Residual Mixture retrieval [§]	X, Y	32-bit float	n/a	-9999.0 = Fill

Table 8 – AUXILIARY Fields (4.4 KM PRODUCTS)

Medium Mode Aerosol Optical Depth Raw *[atmosphere optical thickness due to medium mode ambient aerosol particles]* AOD fraction at 550 nm due to medium mode aerosols (particle radius 0.35 – 0.7 μm). Requires successful Lowest Residual Mixture retrieval §	X, Y	32-bit float	n/a	-9999.0 = Fill
Large_Mode_Aerosol_Optical_Depth_Raw *[atmosphere optical thickness due to large mode ambient aerosol particles]* AOD fraction at 550 nm due to large mode aerosols (particle radius > 0.7 μm). Requires successful Lowest Residual Mixture retrieval §	X, Y	32-bit float	n/a	-9999.0 = Fill
Single_Scattering_Albedo_446nm_Raw *[single scattering albedo in air due to ambient aerosol particles]* SSA at 446 nm from the Lowest Residual Mixture§	X, Y	32-bit float	n/a	-9999.0 = Fill
Single_Scattering_Albedo_558nm_Raw *[single scattering albedo in air due to ambient aerosol particles]* SSA at 558 nm from the Lowest Residual Mixture§	X, Y	32-bit float	n/a	-9999.0 = Fill
Single_Scattering_Albedo_672nm_Raw *[single scattering albedo in air due to ambient aerosol particles]* SSA at 672 nm from the Lowest Residual Mixture§	X, Y	32-bit float	n/a	-9999.0 = Fill
Single_Scattering_Albedo_867nm_Raw *[single scattering albedo in air due to ambient aerosol particles]* SSA at 867 nm from the Lowest Residual Mixture§	X, Y	32-bit float	n/a	-9999.0 = Fill
Aerosol_Retrieval_Confidence_Index Retrieval confidence index (Dark Water only); larger numbers indicate better agreement between the modeled aerosol observations and the MISR instrument observations	X, Y	32-bit float	n/a	-9999.0 = Fill
Aerosol_Optical_Depth_Per_Mixture *[atmosphere optical thickness due to ambient aerosol particles]* AOD at 550 nm reported for all MISR mixtures	X, Y, Mixture	32-bit float	n/a	-9999.0 = Fill
Minimum_Chisq_Per_Mixture Smallest χ^2 fitting parameter (χ^2_{abs} for Dark Water, χ^2_{het} for Het Surf) for each mixture	X, Y, Mixture	32-bit float	n/a	-9999.0 = Fill

Table 8 – AUXILIARY Fields (4.4 KM PRODUCTS)

Legacy Aerosol Retrieval Success Flag Per Mixture Aerosol retrieval success flag per mixture. Determines set of mixtures from which the lowest residual is selected	X, Y, Mixture	8-bit integer	n/a	-1 = Fill 0 = Not successful 1 = Successful
Cloud_Screening_Parameter Fraction of subregions flagged as clear (not including glint contaminated subregions)	X, Y	32-bit float	n/a	-9999.0 = Fill 0.0 = No clear 1.0 = Completely clear
Cloud Screening Parameter Neighbor 3×3 Average of *Cloud Screening Parameter* for 3×3 surrounding regions (including the central region of interest)	X, Y	32-bit float	n/a	-9999.0 = Fill 0.0 = No clear 1.0 = Completely clear
Aerosol_Retrieval_Screening_Flags High-level summary of the results of the algorithm screening	X, Y	8-bit unsigned integer	n/a	0 = pass all 1 = geographic exclusion 2 = near cloud 3 = low confidence index 4 = outside nadir camera view 5 = cloud 6 = not correlated 7 = not smooth 8 = shallow water 9 = low sun 10 = topographically complex 11 = other no attempt 12 = no solution 253 = Fill
Column_Ozone_Climatology *[atmosphere mole content of ozone]* Volume of the column ozone used in the retrieval	X, Y	32-bit float	Dobson Units	-9999.0 = Fill
Ocean_Surface_Wind_Speed_Climatology *[sea_surface_wind_speed]* Near-surface wind speed from TASC dataset (only used in Dark Water algorithm)	X, Y	32-bit float	meters per second	-9999.0 = Fill
Ocean_Surface_Wind_Speed_Retrieved *[sea_surface_wind_speed]* Near-surface wind speed retrieved using glint pattern, from lowest residual mixture. Only reported where sufficient glint is present and a lowest residual mixture is available. Quantized at values of 2.0, 5.0, and 7.5 ms^{-1} (available only from Dark Water algorithm)	X, Y	32-bit float	meters per second	-9999.0 = Fill

Table 8 – AUXILIARY Fields (4.4 KM PRODUCTS)

Rayleigh_Optical_Depth *[atmosphere optical thickness due to rayleigh scattering]* Optical depth due to Rayleigh scattering at 550 nm	X, Y	32-bit float	n/a	-9999.0 = Fill
Lowest_Residual_Mixture Aerosol mixture with smallest combined residual, out of the set of successful mixtures. See Aerosol ATBD for the definition of the combined residual. Unavailable where no mixture is successful	X, Y	32-bit integer	n/a	-9999 = Fill

Table 9 – GEOMETRY Fields (4.4 KM PRODUCTS)

Field Name *[CF standard_name]* Parameter Description	**Dimensions**	**Data Type**	**Units**	**Flag Values**
Solar_Zenith_Angle *[solar_zenith_angle]* The angle of the sun relative to overhead (0°)	X, Y	32-bit float	angular degree	-9999.0 = Fill
Solar_Azimuth_Angle *[solar_azimuth_angle]* Angle measured clockwise relative to local north of the projection of the solar illumination vector onto a horizontal plane. The illumination vector points in the direction of photon travel, away from the Sun. The opposing vector, pointing *toward* the Sun, is given by [(Solar_Azimuth_Angle + 180°) modulo 360°]	X, Y	32-bit float	angular degree	-9999.0 = Fill
View_Zenith_Angle *[sensor_zenith_angle]* Zenith angle of the observation relative to nadir (0°)	X, Y, Camera	16-bit unsigned integer (See Table 12, scale_factor)	angular degree	65533 = Fill 65534 = Underflow 65535 = Overflow

View_Azimuth_Angle *[sensor_azimuth_angle]* Angle measured clockwise relative to local north of the projection of the view vector onto a horizontal plane. The view vector points in the direction of photon travel	X, Y, Camera	16-bit unsigned integer (See Table 12, scale_factor)	angular degree	65533 = Fill 65534 = Underflow 65535 = Overflow
Scattering_Angle *[scattering_angle]* The angle between the vector pointing in the direction of travel of the direct sunlight and the vector pointing toward the instrument	X, Y, Camera	16-bit unsigned integer (See Table 12, scale_factor)	angular degree	65533 = Fill 65534 = Underflow 65535 = Overflow
Glint_Angle *[sunglint_angle]* The angle between the vector pointing in the direction of specularly reflected direct sunlight from a horizontal surface and the vector pointing toward the instrument	X, Y, Camera	16-bit unsigned integer (See Table 12, scale_factor)	angular degree	65533 = Fill 65534 = Underflow 65535 = Overflow

Table 10 – COMPONENT_PARTICLE_INFORMATION (METADATA)

Field Name	Description
Summary_Table	Plain text summary of component particle properties. Included in the Appendix (Section 3.2), for convenience.
Aerosol_Model_Name	A string list containing the aerosol component particles described in this group. For convenience, the component particle names are listed here, and particle composition for which these are possible optical analogs (in parentheses): 1. spherical_nonabsorbing_0.06 (sulfate, sea salt, organic) 2. spherical_nonabsorbing_0.12 (sulfate, sea salt, organic) 3. spherical_nonabsorbing_0.26 (sulfate, sea salt, organic) 4. spherical_nonabsorbing_0.57 (sulfate, sea salt, organic) 5. spherical_nonabsorbing_1.28 (sea salt, organic) 6. spherical_nonabsorbing_2.80 (sea salt, organic) 7. spherical_absorbing_0.06_ssa_green_0.9 (sulfate, sea salt, organic) 8. spherical_absorbing_0.12_ssa_green_0.9 (sulfate, sea salt, organic) 9. spherical_absorbing_0.26_ssa_green_0.9 (sulfate, sea salt, organic) 10. spherical_absorbing_0.57_ssa_green_0.9 (sulfate, sea salt, organic) 11. spherical_absorbing_1.28_ssa_green_0.9 (sea salt, organic) 12. spherical_absorbing_2.80_ssa_green_0.9 (sea salt, organic) 13. spherical_absorbing_0.06_ssa_green_0.8 (sulfate, sea salt, organic) 14. spherical_absorbing_0.12_ssa_green_0.8 (sulfate, sea salt, organic) 15. spherical_absorbing_0.26_ssa_green_0.8 (sulfate, sea salt, organic) 16. spherical_absorbing_0.57_ssa_green_0.8 (sulfate, sea salt, organic) 17. spherical_absorbing_1.28_ssa_green_0.8 (sea salt, organic) 18. spherical_absorbing_2.80_ssa_green_0.8 (sea salt, organic) 19. grains_mode1_h1 (dust) 20. grains_mode1_h4 (dust) 21. spheroidal_mode2_h1 (dust)
Arithmetic_Mean_Radius	Arithmetic mean radius of the log-normal size distribution (in μm)
Band_Dim	Band dimension: 1 = Blue (446 nm), 2 = Green (558 nm), 3 = Red (672 nm), 4 = Near IR (867 nm)
Effective_Particle_Radius	Effective radius of the log-normal size distribution (in μm)
Effective_Size_Variance	Effective variance of the log-normal size distribution
Layer_Base_Height	Assumed base height of the aerosol layer (km)
Layer_Scale_Height	Assumed scale height of the aerosol layer (km)
Layer_Top_Height	Assumed top height of the aerosol layer (km)
Log_Normal_Characteristic_Radius	Characteristic radius of the log-normal size distribution (in μm)
Log_Normal_Characteristic_Width	Characteristic width of the log-normal size distribution
MISR_Wavelength	In band solar weighted center wavelength of each MISR spectral band (in μm)
Maximum_Radius	Maximum radius used in single scattering (e.g., Mie) calculation (in μm)
Minimum_Radius	Minimum radius used in single scattering (e.g., Mie) calculation (in μm)
Model_Dim	Model number dimension

Particle_Class_Description	A string list describing the five particle classes: 1. Small < 0.35 μm radius 2. Medium 0.35 to 0.7 μm radius 3. Large > 0.7 μm radius 4. Spherical 5. Non-spherical
Particle_Class_Dim	Particle class dimension
Particle Fractional Number Per Classification	Fractional number of each particle classification for each model
Particle Fractional Spectral Optical Depth Per Classification	Spectral AOD of each particle classification for each model by band
Scattering_Angle_Dim	Scattering angle dimension
Shape	Descriptive names, indicating component particle shapes. (e.g., "spherical", "Grains Mode1 H1")
Size_Distribution	Descriptive names, indicating component particle size distribution. (e.g., "Log normal")
Spectral_Anisotropy_Parameter	The spectral anisotropy ("g-factor") for each model by band
Spectral_Extinction_Cross_Section	Extinction cross section for each model by band (μm^2)
Spectral_Phase_Functions	Phase function for each model as a function of scattering angle by band
Spectral_Refractive_Index_Imaginary	Imaginary part of the refractive index for each model by band
Spectral_Refractive_Index_Real	Real part of the refractive index for each model by band
Spectral_Scattering_Cross_Section	Scattering cross section of each model by band (μm^2)
Spectral_Single_Scattering_Albedo	SSA of each model by band
Suggested_Particle_Density	Component particle density ($g\ cm^{-3}$) – not used in the retrieval process
Volume_Weighted_Mean_Radius	Mean radius of the log-normal size distribution weighted by particle volume
Weighted Mean Particle Cross Section	Mean geometric cross sectional area per particle, weighted by the particle size distribution (μm^2)
Weighted_Mean_Particle_Volume	Mean volume per particle, weighted by the particle size distribution (μm^3)

Table 11 – MIXTURE_INFORMATION (METADATA)

Field Name	Description
Summary_Table	Plain text summary of mixture properties. Included in the Appendix (Section 3.3), for convenience.
Angstrom_Exponent_4_Band	Ångström exponent calculated as the linear least squares fit of the AODs through the four MISR wavelengths
Band_Dim	Band dimension: 1 = Blue (446 nm), 2 = Green (558 nm), 3 = Red (672 nm), 4 = Near IR (867 nm)
Component_Dim	Component dimension (up to three components are used per mixture)
Component Fractional Optical Depth In Reference Band	Fraction of AOD contributed by each component particle in the mixture for the MISR green band (558 nm)
Component Fractional Spectral Optical Depth	Fractional optical depth for each component particle in the mixture by band
Component_Model_Number	Aerosol component particles used to construct each mixture
MISR_Wavelength	In band solar weighted center wavelength of each MISR spectral band (in μm)
Mixture_Class_Description	A string list describing the five mixture classes: 1. Small < 0.35 μm radius 2. Medium 0.35 to 0.7 μm radius 3. Large > 0.7 μm radius 4. Spherical 5. Non-spherical
Mixture_Class_Dim	Mixture class dimension
Mixture Fractional Number Per Classification	Fractional number of each mixture classification for each mixture by band
Mixture Fractional Spectral Optical Depth Per Classification	Spectral AOD of each mixture classification for each mixture by band
Mixture Fractional Volume Per Classification	Fraction of each mixture classification for each mixture by band weighted by particle volume
Mixture_Name	String list of mixture names
Mixure_Spectral_Phase_Functions	Phase function for each mixture as a function of scattering angle by band
Mixture Spectral Single Scattering Albedo	SSA of each mixture by band
Normalized Mixture Spectral Optical Depth	Spectral optical depth at each of the four MISR wavelengths normalized to the optical depth for the MISR green band (558 nm) for each mixture
Scattering_Angle_Dim	Scattering angle dimension

Table 12 – Common Attributes of Dimensions and Fields (Where Applicable)

Attribute Name	Description

coordinates	NetCDF CF standard attribute for specifying alternative sets of coordinate values. In this product, spatially gridded data is implicitly geolocated by the SOM X and Y coordinates of each grid cell. Latitude and Longitude fields serve as an alternative source of geolocation. The Time field serves as an alternative to the SOM X (along-track) coordinate. Example:
	
	`uint16 Aerosol_Optical_Depth(X, Y);`
	`    :coordinates = “Latitude Longitude Time”;`

calendar	CF standard attribute specifying reference calendar for time units. Value of “standard” specifies standard Gregorian/Julian calendar. Example:
	
	`double Time(X);`
	`  :calendar=”standard”`
	`  :units=”seconds since 2007-01-24T05:05:38.043934Z”`

units	CF standard attribute specifying units of measurement (e.g., meters, seconds). See calendar example, above.

long_name
comment
	CF standard attributes for specifying more descriptive information about a field.
	Example:
	
	`short Elevation(X, Y);`
	`    :standard_name=”surface_height_above_reference_ellipsoid”`
	`    :long_name=”Surface elevation”`
	`    :comment=”Reference ellipsoid is WGS84”`

flag_values,
flag_meanings
	CF standard attributes for assigning meanings to numeric values. Example:
	
	`int Camera_Dim(Camera_Dim);`
	`    :flag_values = 1, 2, 3, 4, 5, 6, 7, 8, 9`
	`    :flag_meanings = “D_forward C_forward B_forward A_forward A_nadir A_aftward B_aftward C_aftward D_aftward”`

standard_name	CF standard attribute for specifying the common name of a field. Example:
	
	`double X_Dim(X_Dim);`
	`    :axis=”X”`
	`    :long_name=” Space-oblique Mercator Along-Track”`
	`    :standard_name=”projection_x_coordinate”`
	`    :units=”meters”`

axis	CF standard attribute for specifying coordinate axis associated with a dimension. See standard_name example above.

scale_factor,
add_offset,
valid_range
 	
(underflow)
(overflow)
	CF standard attributes for packed data. To translate packed (integer) values to real (float) values:
	
	*float_value = integer_value * scale_factor + add_offset*
	
	The valid range of integer values for which the above formula holds is given by valid_range. Integer values outside the valid range should be interpreted as either fill values or flag values (if provided). Example:
	
	`uint16 View_Zenith_Angle(X, Y, Camera);`
	`:scale_factor = 0.1`
	`:add_offset = 0.0`
	`:valid_range = 0, 65532`
	`:flag_values = 65534, 65535`
	`:flag_meanings = "underflow, overflow"`
	`:_FillValue = 65533`
	
	Underflow and overflow flags indicate values outside the allowed range. For example, a view zenith angle of -0.5 cannot be numerically represented in the above example. Underflow represents values less than the minimum allowed. Overflow represents values greater than the maximum allowed.

_FillValue	CF standard attribute for specifying fill value.

† The Time variable is derived by interpolation of Block Center Time samples reported in the An camera GRP_ELLIPSOID product. This approximates the average time of acquisition of the 9 MISR camera views at a given location. The offset in time between the first (Df) camera view and the last (Da) camera view, at any given location, is approximately 7 minutes. More precise acquisition time per camera, per sample location, can be obtained from coefficients recorded in the PerBlockMetadataRad table of the GRP_ELLIPSOID products.

‡ Spectral scaling coefficients are meant to allow calculations of AOD for wavelengths only in the range from about 400 to 900 nm. Extrapolation to wavelengths beyond these limits is not recommended.

§ Aerosol particle size, shape, and absorption characteristics are determined from the **Lowest Residual Mixture**, selected from among only the successful mixtures, and are therefore unavailable when no mixtures are successful. However, the Dark Water Algorithm can still retrieve an AOD, even if no mixtures are considered successful. Therefore, AODs may be reported without other aerosol particle properties.

3 Appendix

3.1 ACRONYM LIST

ACP......................Aerosol Climatology Product
AGP ....Ancillary Geographic Product
AOD.....................Aerosol Optical Depth
APOP ....Aerosol Physical and Optical Properties
ATBD...................Algorithm Theoretical Basis Document
AU........................Astronomical Unit
CF.........................Climate and Forecast
DAAC ....Distributed Active Archive Center
DID ....DTED Intermediate Dataset
DMS.....................Degrees Minutes Seconds
DTED...................Digital Terrain Elevation Dataset
ECS ....EOSDIS Core System
EOF ....Empirical Orthogonal Function
EOS ....Earth Observing System
EOSDIS ....Earth Observing System Data and Information System
ESDT....................Earth Science Data Type
GCTP ....General Cartographic Transformation Package
GSFC ....Goddard Space Flight Center
HDF ....Hierarchical Data Format
HDF-EOS............Hierarchical Data Format for EOS
ISO ....International Organization for Standardization
JPL ....Jet Propulsion Laboratory
LaRC....................Langley Research Center
LUT......................Look Up Table
MISR....................Multi-angle Imaging SpectroRadiometer
NASA...................National Aeronautics and Space Administration
NetCDF ....Network Common Data Format
PGE......................Product Generation Executable
RCCT ....Radiometric Camera-by-camera Cloud mask Threshold
SCF ....Science Computing Facility
SDP ....Science Data Processing

SMART................Simulated MISR Ancillary Radiative Transfer
SOM.....................Space-Oblique Mercator
SSA ....Single Scattering Albedo
TASC ....Terrestrial Atmosphere and Surface Climatology
TOA ....Top-Of-Atmosphere
UTC......................Coordinated Universal Time
WGS84.................World Geodetic System 1984

3.2 COMPONENT PARTICLE PROPERTIES SUMMARY TABLE

Part 1: Physical properties

Component particle number	Minimum radius (micro-meters)	Maximum radius (micro-meters)	Log normal character-istic radius (micro-meters)	Log normal character-istic width (micro-meters)	Density (g/cm^3) **see note	Bottom (km)	Top (km)	Scale height (km)	Shape (see shape types below)	Component particle name (*see note)
(1)	0.00100	0.400	0.0300	1.65	1.70	0.00	10.0	2.00	<1>	spherical_nonabsorbing_0.06 (sulfate, sea salt, organic)
(2)	0.00100	0.750	0.0600	1.70	1.77	0.00	10.0	2.00	<1>	spherical_nonabsorbing_0.12 (sulfate, sea salt, organic)
(3)	0.0100	1.50	0.120	1.75	1.84	0.00	10.0	2.00	<1>	spherical_nonabsorbing_0.26 (sulfate, sea salt, organic)
(4)	0.0100	4.00	0.240	1.80	1.91	0.00	10.0	2.00	<1>	spherical_nonabsorbing_0.57 (sulfate, sea salt, organic)
(5)	0.0100	8.00	0.500	1.85	1.99	0.00	10.0	2.00	<1>	spherical_nonabsorbing_1.28 (sea salt, organic)
(6)	0.100	50.0	1.00	1.90	2.13	0.00	10.0	2.00	<1>	spherical_nonabsorbing_2.80 (sea salt, organic)
(7)	0.00100	0.400	0.0300	1.65	1.70	0.00	10.0	2.00	<1>	spherical_absorbing_0.06_ssa_green_0.9 (sulfate, sea salt, organic)
(8)	0.00100	0.750	0.0600	1.70	1.77	0.00	10.0	2.00	<1>	spherical_absorbing_0.12_ssa_green_0.9 (sulfate, sea salt, organic)
(9)	0.0100	1.50	0.120	1.75	1.84	0.00	10.0	2.00	<1>	spherical_absorbing_0.26_ssa_green_0.9 (sulfate, sea salt, organic)
(10)	0.0100	4.00	0.240	1.80	1.91	0.00	10.0	2.00	<1>	spherical_absorbing_0.57_ssa_green_0.9 (sulfate, sea salt, organic)
(11)	0.0100	8.00	0.500	1.85	1.99	0.00	10.0	2.00	<1>	spherical_absorbing_1.28_ssa_green_0.9 (sea salt, organic)
(12)	0.100	50.0	1.00	1.90	2.13	0.00	10.0	2.00	<1>	spherical_absorbing_2.80_ssa_green_0.9 (sea salt, organic)
(13)	0.00100	0.400	0.0300	1.65	1.70	0.00	10.0	2.00	<1>	spherical_absorbing_0.06_ssa_green_0.8 (sulfate, sea salt, organic)
(14)	0.00100	0.750	0.0600	1.70	1.77	0.00	10.0	2.00	<1>	spherical_absorbing_0.12_ssa_green_0.8 (sulfate, sea salt, organic)
(15)	0.0100	1.50	0.120	1.75	1.84	0.00	10.0	2.00	<1>	spherical_absorbing_0.26_ssa_green_0.8 (sulfate, sea salt, organic)
(16)	0.0100	4.00	0.240	1.80	1.91	0.00	10.0	2.00	<1>	spherical_absorbing_0.57_ssa_green_0.8 (sulfate, sea salt, organic)
(17)	0.0100	8.00	0.500	1.85	1.99	0.00	10.0	2.00	<1>	spherical_absorbing_1.28_ssa_green_0.8 (sea salt, organic)
(18)	0.100	50.0	1.00	1.90	2.13	0.00	10.0	2.00	<1>	spherical_absorbing_2.80_ssa_green_0.8 (sea salt, organic)
(19)	0.100	1.00	0.500	1.50	2.60	3.00	6.00	10.0	<2>	grains_model1_h1 (dust)
(20)	0.100	1.00	0.500	1.50	2.60	3.00	6.00	10.0	<3>	grains_model1_h4 (dust)
(21)	0.100	6.00	1.00	2.00	2.60	3.00	6.00	10.0	<4>	spheroidal_mode2_h1 (dust)

Part 2: Optical properties

Component particle number	Band	Spectral refractive index real	Spectral refractive index imaginary	Spectral extinction cross-section (micro-meters^2)	Spectral single scattering albedo	Spectral ansiotropy parameter (g factor) ***see note	Component particle name (*see note)
(1)	blue	1.45	0.00	0.000772	1.00	0.431	spherical_nonabsorbing_0.06 (sulfate, sea salt, organic)
	green	1.45	0.00	0.000396	1.00	0.352	
	red	1.45	0.00	0.000217	1.00	0.287	
	nir	1.45	0.00	9.09e-05	1.00	0.207	
(2)	blue	1.45	0.00	0.0207	1.00	0.654	spherical_nonabsorbing_0.12 (sulfate, sea salt, organic)
	green	1.45	0.00	0.0134	1.00	0.609	
	red	1.45	0.00	0.00885	1.00	0.563	
	nir	1.45	0.00	0.00467	1.00	0.488	
(3)	blue	1.45	0.00	0.216	1.00	0.726	spherical_nonabsorbing_0.26 (sulfate, sea salt, organic)
	green	1.45	0.00	0.182	1.00	0.717	
	red	1.45	0.00	0.150	1.00	0.703	
	nir	1.45	0.00	0.105	1.00	0.674	
(4)	blue	1.45	0.00	1.02	1.00	0.718	spherical_nonabsorbing_0.57 (sulfate, sea salt, organic)
	green	1.45	0.00	1.04	1.00	0.722	
	red	1.45	0.00	1.03	1.00	0.725	
	nir	1.45	0.00	0.952	1.00	0.726	
(5)	blue	1.45	0.00	4.02	1.00	0.741	spherical_nonabsorbing_1.28 (sea salt, organic)
	green	1.45	0.00	4.19	1.00	0.728	
	red	1.45	0.00	4.35	1.00	0.721	
	nir	1.45	0.00	4.59	1.00	0.718	
(6)	blue	1.45	0.00	15.9	1.00	0.786	spherical_nonabsorbing_2.80 (sea salt, organic)
	green	1.45	0.00	16.2	1.00	0.775	
	red	1.45	0.00	16.5	1.00	0.763	
	nir	1.45	0.00	17.0	1.00	0.747	
(7)	blue	1.45	0.00550	0.000822	0.928	0.431	spherical_absorbing_0.06_ssa_green_0.9 (sulfate, sea salt, organic)
	green	1.45	0.00550	0.000436	0.900	0.351	
	red	1.45	0.00550	0.000250	0.863	0.287	
	nir	1.45	0.00550	0.000115	0.785	0.207	
(8)	blue	1.45	0.0147	0.0212	0.911	0.659	spherical_absorbing_0.12_ssa_green_0.9 (sulfate, sea salt, organic)
	green	1.45	0.0147	0.0141	0.900	0.612	
	red	1.45	0.0147	0.00953	0.885	0.564	
	nir	1.45	0.0147	0.00527	0.853	0.487	
(9)	blue	1.45	0.0179	0.213	0.894	0.748	spherical_absorbing_0.26_ssa_green_0.9 (sulfate, sea salt, organic)
	green	1.45	0.0179	0.181	0.900	0.733	
	red	1.45	0.0179	0.150	0.901	0.716	
	nir	1.45	0.0179	0.107	0.897	0.682	
(10)	blue	1.45	0.0108	1.01	0.879	0.753	spherical_absorbing_0.57_ssa_green_0.9 (sulfate, sea salt, organic)
	green	1.45	0.0108	1.03	0.900	0.750	
	red	1.45	0.0108	1.02	0.913	0.748	
	nir	1.45	0.0108	0.942	0.926	0.743	
(11)	blue	1.45	0.00446	4.02	0.878	0.774	spherical_absorbing_1.28_ssa_green_0.9 (sea salt, organic)
	green	1.45	0.00446	4.18	0.899	0.756	
	red	1.45	0.00446	4.35	0.915	0.745	
	nir	1.45	0.00446	4.58	0.934	0.737	
(12)	blue	1.45	0.00205	15.9	0.881	0.818	spherical_absorbing_2.80_ssa_green_0.9 (sea salt, organic)
	green	1.45	0.00205	16.2	0.899	0.801	
	red	1.45	0.00205	16.5	0.913	0.787	
	nir	1.45	0.00205	17.0	0.930	0.766	
(13)	blue	1.45	0.0123	0.000883	0.852	0.430	spherical_absorbing_0.06_ssa_green_0.8 (sulfate, sea salt, organic)
	green	1.45	0.0123	0.000485	0.800	0.351	
	red	1.45	0.0123	0.000290	0.738	0.286	
	nir	1.45	0.0123	0.000145	0.619	0.206	
(14)	blue	1.45	0.0325	0.0219	0.821	0.664	spherical_absorbing_0.12_ssa_green_0.8 (sulfate, sea salt, organic)
	green	1.45	0.0325	0.0149	0.800	0.614	
	red	1.45	0.0325	0.0103	0.773	0.564	
	nir	1.45	0.0325	0.00599	0.720	0.486	
(15)	blue	1.45	0.0412	0.209	0.792	0.767	spherical_absorbing_0.26_ssa_green_0.8 (sulfate, sea salt, organic)
	green	1.45	0.0412	0.179	0.800	0.748	
	red	1.45	0.0412	0.150	0.800	0.727	
	nir	1.45	0.0412	0.110	0.791	0.689	
(16)	blue	1.45	0.0268	0.999	0.768	0.787	spherical_absorbing_0.57_ssa_green_0.8 (sulfate, sea salt, organic)
	green	1.45	0.0268	1.02	0.800	0.778	
	red	1.45	0.0268	1.00	0.821	0.772	

	nir	1.45	0.0268	0.929	0.842	0.761	
(17)	blue	1.45	0.0111	4.02	0.767	0.806	spherical_absorbing_1.28_ssa_green_0.8 (sea salt, organic)
	green	1.45	0.0111	4.18	0.799	0.785	
	red	1.45	0.0111	4.33	0.826	0.771	
	nir	1.45	0.0111	4.56	0.859	0.758	
(18)	blue	1.45	0.00520	15.9	0.771	0.847	spherical_absorbing_2.80_ssa_green_0.8 (sea salt, organic)
	green	1.45	0.00520	16.2	0.799	0.828	
	red	1.45	0.00520	16.5	0.822	0.811	
	nir	1.45	0.00520	17.0	0.852	0.787	
(19)	blue	1.50	0.00410	2.84	0.919	0.705	grains_mode1_h1 (dust)
	green	1.51	0.00210	3.17	0.977	0.711	
	red	1.51	0.000650	3.37	0.994	0.729	
	nir	1.51	0.000470	3.42	0.997	0.747	
(20)	blue	1.54	0.0210	2.81	0.722	0.772	grains_mode1_h4 (dust)
	green	1.54	0.00890	3.13	0.908	0.715	
	red	1.54	0.00240	3.36	0.979	0.711	
	nir	1.54	0.00160	3.45	0.990	0.729	
(21)	blue	1.51	0.00411	15.3	0.810	0.791	spheroidal_mode2_h1 (dust)
	green	1.51	0.00210	15.5	0.902	0.772	
	red	1.51	0.000650	15.8	0.971	0.741	
	nir	1.51	0.000470	16.3	0.983	0.720	

Shape types:

<1> = Spherical
<2> = Grains Mode1 H1
<3> = Grains Mode1 H4
<4> = spheroids Mode2 H1

See reference [1] for a description of grains and spheroids.

Notes:

- Not all particles are used in the current MISR aerosol standard retrieval algorithm. The set of particles used is controlled by the "MIXTURE" part of the MISR Aerosol Climatology Product (ACP). The ACP MIXTURE content is copied into the MIXTURE_INFORMATION group of the MISR Level 2 Aerosol Parameters product. Within that group, is a "Summary_Table" variable including the list of particles used.

* The decimal number immediately following the word "absorbing" or "nonabsorbing" in each spherical particle name is the effective radius of the particle in micrometers. The decimal number following "ssa_green" is single-scattering albedo in the green (558 nm) band.

** Particle density is included as a suggested value, for information only; we do not use this quantity in the retrieval process.

*** The asymmetry parameter (g) may be useful for calculating radiative fluxes from the MISR product, but to calculate radiances accurately, the full single scattering phase function is needed. The spectral phase functions are contained in the HDF structure named "Spectral Phase Functions" in the "APOP" part of the MISR Aerosol Climatology Product (ACP). ACP APOP content can also be found in the COMPONENT_PARTICLE_INFORMATION group of the Level 2 Aerosol product.

References:

[1] Kalashnikova, O.V., R. Kahn, I.N. Sokolik and W.-H Li, "The ability of multi-angle remote sensing observations to identify and distinguish mineral dust types: Part 1. Optical models and retrievals of optically thick plumes.", J. Geophys. Res., 2004

3.3 MIXTURE PROPERTIES SUMMARY TABLE

Mix #	Component Fractional Amount in Green Band (558 nm)			AOT rel/to green blue	green	nir	Single Scattering Albedo blue	green	red	nir	Angstrom exponent	Mixture name (*see note)
1	1.00 (1)			1.950	1.000	0.230	1.000	1.000	1.000	1.000	3.228	Spherical_Reff_0.06_Reff_2.80_Nonabsorbing
2	0.95 (1)	0.05 (6)		1.902	1.000	0.271	1.000	1.000	1.000	1.000	2.943	Spherical_Reff_0.06_Reff_2.80_Nonabsorbing
3	0.90 (1)	0.10 (6)		1.853	1.000	0.312	1.000	1.000	1.000	1.000	2.692	Spherical_Reff_0.06_Reff_2.80_Nonabsorbing
4	0.80 (1)	0.20 (6)		1.756	1.000	0.394	1.000	1.000	1.000	1.000	2.257	Spherical_Reff_0.06_Reff_2.80_Nonabsorbing
5	0.70 (1)	0.30 (6)		1.660	1.000	0.476	1.000	1.000	1.000	1.000	1.884	Spherical_Reff_0.06_Reff_2.80_Nonabsorbing
6	0.60 (1)	0.40 (6)		1.563	1.000	0.558	1.000	1.000	1.000	1.000	1.551	Spherical_Reff_0.06_Reff_2.80_Nonabsorbing
7	0.50 (1)	0.50 (6)		1.466	1.000	0.641	1.000	1.000	1.000	1.000	1.245	Spherical_Reff_0.06_Reff_2.80_Nonabsorbing
8	0.40 (1)	0.60 (6)		1.370	1.000	0.723	1.000	1.000	1.000	1.000	0.959	Spherical_Reff_0.06_Reff_2.80_Nonabsorbing
9	0.30 (1)	0.70 (6)		1.273	1.000	0.805	1.000	1.000	1.000	1.000	0.685	Spherical_Reff_0.06_Reff_2.80_Nonabsorbing
10	0.20 (1)	0.80 (6)		1.176	1.000	0.887	1.000	1.000	1.000	1.000	0.420	Spherical_Reff_0.06_Reff_2.80_Nonabsorbing
11	1.00 (2)			1.541	1.000	0.348	1.000	1.000	1.000	1.000	2.245	Spherical_Reff_0.12_Reff_2.80_Nonabsorbing
12	0.95 (2)	0.05 (6)		1.513	1.000	0.384	1.000	1.000	1.000	1.000	2.073	Spherical_Reff_0.12_Reff_2.80_Nonabsorbing
13	0.90 (2)	0.10 (6)		1.485	1.000	0.419	1.000	1.000	1.000	1.000	1.913	Spherical_Reff_0.12_Reff_2.80_Nonabsorbing
14	0.80 (2)	0.20 (6)		1.429	1.000	0.489	1.000	1.000	1.000	1.000	1.621	Spherical_Reff_0.12_Reff_2.80_Nonabsorbing
15	0.70 (2)	0.30 (6)		1.374	1.000	0.559	1.000	1.000	1.000	1.000	1.357	Spherical_Reff_0.12_Reff_2.80_Nonabsorbing
16	0.60 (2)	0.40 (6)		1.318	1.000	0.630	1.000	1.000	1.000	1.000	1.115	Spherical_Reff_0.12_Reff_2.80_Nonabsorbing
17	0.50 (2)	0.50 (6)		1.262	1.000	0.700	1.000	1.000	1.000	1.000	0.889	Spherical_Reff_0.12_Reff_2.80_Nonabsorbing
18	0.40 (2)	0.60 (6)		1.206	1.000	0.770	1.000	1.000	1.000	1.000	0.676	Spherical_Reff_0.12_Reff_2.80_Nonabsorbing
19	0.30 (2)	0.70 (6)		1.150	1.000	0.841	1.000	1.000	1.000	1.000	0.472	Spherical_Reff_0.12_Reff_2.80_Nonabsorbing
20	0.20 (2)	0.80 (6)		1.094	1.000	0.911	1.000	1.000	1.000	1.000	0.276	Spherical_Reff_0.12_Reff_2.80_Nonabsorbing
21	1.00 (3)			1.185	1.000	0.576	1.000	1.000	1.000	1.000	1.090	Spherical_Reff_0.26_Reff_2.80_Nonabsorbing
22	0.95 (3)	0.05 (6)		1.175	1.000	0.600	1.000	1.000	1.000	1.000	1.016	Spherical_Reff_0.26_Reff_2.80_Nonabsorbing
23	0.90 (3)	0.10 (6)		1.165	1.000	0.624	1.000	1.000	1.000	1.000	0.945	Spherical_Reff_0.26_Reff_2.80_Nonabsorbing
24	0.80 (3)	0.20 (6)		1.144	1.000	0.671	1.000	1.000	1.000	1.000	0.807	Spherical_Reff_0.26_Reff_2.80_Nonabsorbing
25	0.70 (3)	0.30 (6)		1.124	1.000	0.719	1.000	1.000	1.000	1.000	0.677	Spherical_Reff_0.26_Reff_2.80_Nonabsorbing
26	0.60 (3)	0.40 (6)		1.104	1.000	0.766	1.000	1.000	1.000	1.000	0.553	Spherical_Reff_0.26_Reff_2.80_Nonabsorbing
27	0.50 (3)	0.50 (6)		1.084	1.000	0.814	1.000	1.000	1.000	1.000	0.434	Spherical_Reff_0.26_Reff_2.80_Nonabsorbing
28	0.40 (3)	0.60 (6)		1.064	1.000	0.861	1.000	1.000	1.000	1.000	0.320	Spherical_Reff_0.26_Reff_2.80_Nonabsorbing
29	0.30 (3)	0.70 (6)		1.043	1.000	0.909	1.000	1.000	1.000	1.000	0.209	Spherical_Reff_0.26_Reff_2.80_Nonabsorbing
30	0.20 (3)	0.80 (6)		1.023	1.000	0.956	1.000	1.000	1.000	1.000	0.102	Spherical_Reff_0.26_Reff_2.80_Nonabsorbing
31	1.00 (8)			1.507	1.000	0.375	0.911	0.900	0.885	0.853	2.102	Spherical_Reff_0.12_SSA_green_0.9_Reff_2.80_SSA_green_1.0_Absorbing
32	0.95 (8)	0.05 (6)		1.480	1.000	0.408	0.914	0.905	0.893	0.872	1.945	Spherical_Reff_0.12_SSA_green_0.9_Reff_2.80_SSA_green_1.0_Absorbing
33	0.90 (8)	0.10 (6)		1.454	1.000	0.442	0.917	0.910	0.902	0.888	1.798	Spherical_Reff_0.12_SSA_green_0.9_Reff_2.80_SSA_green_1.0_Absorbing
34	0.80 (8)	0.20 (6)		1.402	1.000	0.510	0.924	0.920	0.916	0.914	1.528	Spherical_Reff_0.12_SSA_green_0.9_Reff_2.80_SSA_green_1.0_Absorbing
35	0.70 (8)	0.30 (6)		1.349	1.000	0.578	0.931	0.930	0.930	0.933	1.282	Spherical_Reff_0.12_SSA_green_0.9_Reff_2.80_SSA_green_1.0_Absorbing
36	0.60 (8)	0.40 (6)		1.297	1.000	0.645	0.938	0.940	0.943	0.949	1.054	Spherical_Reff_0.12_SSA_green_0.9_Reff_2.80_SSA_green_1.0_Absorbing
37	0.50 (8)	0.50 (6)		1.245	1.000	0.713	0.946	0.950	0.954	0.961	0.841	Spherical_Reff_0.12_SSA_green_0.9_Reff_2.80_SSA_green_1.0_Absorbing
38	0.40 (8)	0.60 (6)		1.192	1.000	0.781	0.955	0.960	0.965	0.972	0.638	Spherical_Reff_0.12_SSA_green_0.9_Reff_2.80_SSA_green_1.0_Absorbing
39	0.30 (8)	0.70 (6)		1.140	1.000	0.848	0.965	0.970	0.975	0.981	0.445	Spherical_Reff_0.12_SSA_green_0.9_Reff_2.80_SSA_green_1.0_Absorbing
40	0.20 (8)	0.80 (6)		1.087	1.000	0.916	0.975	0.980	0.984	0.988	0.258	Spherical_Reff_0.12_SSA_green_0.9_Reff_2.80_SSA_green_1.0_Absorbing
41	1.00 (14)			1.470	1.000	0.403	0.821	0.800	0.773	0.720	1.954	Spherical_Reff_0.12_SSA_green_0.8_Reff_2.80_SSA_green_1.0_Absorbing
42	0.95 (14)	0.05 (6)		1.445	1.000	0.435	0.827	0.810	0.790	0.754	1.812	Spherical_Reff_0.12_SSA_green_0.8_Reff_2.80_SSA_green_1.0_Absorbing
43	0.90 (14)	0.10 (6)		1.421	1.000	0.468	0.833	0.820	0.805	0.783	1.678	Spherical_Reff_0.12_SSA_green_0.8_Reff_2.80_SSA_green_1.0_Absorbing
44	0.80 (14)	0.20 (6)		1.372	1.000	0.533	0.847	0.840	0.834	0.831	1.430	Spherical_Reff_0.12_SSA_green_0.8_Reff_2.80_SSA_green_1.0_Absorbing
45	0.70 (14)	0.30 (6)		1.323	1.000	0.598	0.861	0.860	0.861	0.868	1.201	Spherical_Reff_0.12_SSA_green_0.8_Reff_2.80_SSA_green_1.0_Absorbing
46	0.60 (14)	0.40 (6)		1.275	1.000	0.662	0.876	0.880	0.885	0.898	0.989	Spherical_Reff_0.12_SSA_green_0.8_Reff_2.80_SSA_green_1.0_Absorbing
47	0.50 (14)	0.50 (6)		1.226	1.000	0.727	0.893	0.900	0.908	0.922	0.788	Spherical_Reff_0.12_SSA_green_0.8_Reff_2.80_SSA_green_1.0_Absorbing
48	0.40 (14)	0.60 (6)		1.177	1.000	0.792	0.911	0.920	0.929	0.943	0.598	Spherical_Reff_0.12_SSA_green_0.8_Reff_2.80_SSA_green_1.0_Absorbing
49	0.30 (14)	0.70 (6)		1.129	1.000	0.857	0.930	0.940	0.949	0.961	0.415	Spherical_Reff_0.12_SSA_green_0.8_Reff_2.80_SSA_green_1.0_Absorbing
50	0.20 (14)	0.80 (6)		1.080	1.000	0.922	0.951	0.960	0.967	0.976	0.238	Spherical_Reff_0.12_SSA_green_0.8_Reff_2.80_SSA_green_1.0_Absorbing
51	0.72 (2)	0.08 (6)	0.20 (19)	1.367	1.000	0.551	0.989	0.995	0.998	0.999	1.372	Spherical_Reff_0.12_Reff_2.80_Med_Dust
52	0.48 (2)	0.32 (6)	0.20 (19)	1.233	1.000	0.720	0.988	0.995	0.999	0.999	0.812	Spherical_Reff_0.12_Reff_2.80_Med_Dust
53	0.16 (2)	0.64 (6)	0.20 (19)	1.054	1.000	0.945	0.986	0.995	0.999	0.999	0.165	Spherical_Reff_0.12_Reff_2.80_Med_Dust
54	0.54 (2)	0.06 (6)	0.40 (19)	1.249	1.000	0.683	0.977	0.991	0.997	0.998	0.909	Spherical_Reff_0.12_Reff_2.80_Med_Dust
55	0.36 (2)	0.24 (6)	0.40 (19)	1.149	1.000	0.809	0.975	0.991	0.997	0.998	0.526	Spherical_Reff_0.12_Reff_2.80_Med_Dust
56	0.12 (2)	0.48 (6)	0.40 (19)	1.015	1.000	0.978	0.972	0.991	0.998	0.999	0.054	Spherical_Reff_0.12_Reff_2.80_Med_Dust
57	0.36 (2)	0.04 (6)	0.60 (19)	1.131	1.000	0.815	0.962	0.986	0.996	0.998	0.491	Spherical_Reff_0.12_Reff_2.80_Med_Dust
58	0.24 (2)	0.16 (6)	0.60 (19)	1.064	1.000	0.899	0.959	0.986	0.996	0.998	0.251	Spherical_Reff_0.12_Reff_2.80_Med_Dust
59	0.08 (2)	0.32 (6)	0.60 (19)	0.975	1.000	1.012	0.956	0.986	0.997	0.998	-0.058	Spherical_Reff_0.12_Reff_2.80_Med_Dust
60	0.18 (2)	0.02 (6)	0.80 (19)	1.013	1.000	0.947	0.943	0.982	0.995	0.997	0.099	Spherical_Reff_0.12_Reff_2.80_Med_Dust
61	0.12 (2)	0.08 (6)	0.80 (19)	0.980	1.000	0.989	0.941	0.982	0.995	0.997	-0.017	Spherical_Reff_0.12_Reff_2.80_Med_Dust
62	0.04 (2)	0.16 (6)	0.80 (19)	0.935	1.000	1.045	0.938	0.982	0.995	0.997	-0.169	Spherical_Reff_0.12_Reff_2.80_Med_Dust
63	0.40 (2)	0.48 (19)	0.12 (21)	1.165	1.000	0.783	0.951	0.977	0.993	0.995	0.596	Spherical_Reff_0.12_Med_Dust_Coarse_Dust
64	0.40 (2)	0.36 (19)	0.24 (21)	1.176	1.000	0.780	0.940	0.968	0.990	0.993	0.617	Spherical_Reff_0.12_Med_Dust_Coarse_Dust
65	0.40 (2)	0.24 (19)	0.36 (21)	1.187	1.000	0.776	0.928	0.959	0.986	0.991	0.639	Spherical_Reff_0.12_Med_Dust_Coarse_Dust
66	0.40 (2)	0.12 (19)	0.48 (21)	1.199	1.000	0.773	0.918	0.950	0.983	0.988	0.660	Spherical_Reff_0.12_Med_Dust_Coarse_Dust
67	0.20 (2)	0.64 (19)	0.16 (21)	1.039	1.000	0.928	0.927	0.970	0.991	0.995	0.167	Spherical_Reff_0.12_Med_Dust_Coarse_Dust
68	0.20 (2)	0.48 (19)	0.32 (21)	1.054	1.000	0.924	0.910	0.958	0.987	0.992	0.197	Spherical_Reff_0.12_Med_Dust_Coarse_Dust
69	0.20 (2)	0.32 (19)	0.48 (21)	1.069	1.000	0.919	0.894	0.946	0.983	0.990	0.226	Spherical_Reff_0.12_Med_Dust_Coarse_Dust
70	0.20 (2)	0.16 (19)	0.64 (21)	1.084	1.000	0.914	0.879	0.934	0.979	0.987	0.255	Spherical_Reff_0.12_Med_Dust_Coarse_Dust
71		0.80 (19)	0.20 (21)	0.914	1.000	1.073	0.896	0.962	0.990	0.994	-0.243	Med_Dust_Coarse_Dust
72		0.60 (19)	0.40 (21)	0.933	1.000	1.067	0.873	0.947	0.985	0.991	-0.205	Med_Dust_Coarse_Dust
73		0.40 (19)	0.60 (21)	0.951	1.000	1.062	0.851	0.932	0.980	0.989	-0.166	Med_Dust_Coarse_Dust
74		0.20 (19)	0.80 (21)	0.970	1.000	1.056	0.830	0.917	0.976	0.986	-0.129	Med_Dust_Coarse_Dust

Component particle names:

(1) = spherical_nonabsorbing_0.06 (sulfate, sea salt, organic)
(2) = spherical_nonabsorbing_0.12 (sulfate, sea salt, organic)
(3) = spherical_nonabsorbing_0.26 (sulfate, sea salt, organic)
(6) = spherical_nonabsorbing_2.80 (sea salt, organic)
(8) = spherical_absorbing_0.12_ssa_green_0.9 (sulfate, sea salt, organic)
(14) = spherical_absorbing_0.12_ssa_green_0.8 (sulfate, sea salt, organic)
(19) = grains_mode1_h1 (dust)
(21) = spheroidal_mode2_h1 (dust)

Physical and optical properties for component particles are contained in the APOP part of the MISR Aerosol Climatology Product (ACP). ACP APOP content can also be found in the COMPONENT_PARTICLE_INFORMATION group of the Level 2 Aerosol product.

Notes:

* Mixture names are constructed such that they indicate some properties of the component particles. "Spherical" indicates one or more components are spherical in shape. "Reff_<value>" indicates effective radius (e.g. Reff_2.80). "SSA_green_<value>" indicates single-scattering albedo in the green (558 nm) band (e.g. SSA_green_0.9). "Absorbing" mixtures have one or more components with single-scattering albedo less than 1.0. "Nonabsorbing" mixtures have single-scattering albedo of 1.0 for all components.