

OMSAO File Specifications README

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This document lists all swath dimensions, geolocation fields, and data fields present in the SAO OMI data product files of the OMBRO, OMHCHO, and OMOCLO PGEs Algorithm Version v2.0 and higher (Collection/Product Version 003). The contents of this file are essentially a reformatted version of the File Specification (*.fs files) documents which, together with more information on all PGEs, are available at <http://www.cfa.harvard.edu/~tkurosu/SatelliteInstruments/OMI/PGEReleases/>.

1. Swath Dimensions

Name	Data Type	Dimension	Min. Value	Max Value	Description	PGE
nTimes	I4	1	0	9999	Number of swath lines in the granule	all
nXtrack	I4	1	0	60	Number of ground pixels per swath line	all
nUTCdim	I4	1	6	6	Number of elements in a single <i>TimeUTC</i> field entry	all

2. Geolocation Fields

Name	Data Type	Dimension	Min. Value	Max Value	Units	Description	PGE
Latitude	R4	nXtrack,nTimes	-90.0	90.0	deg	The geodetic latitude at the center of the ground pixel	all
Longitude	R4	nXtrack,nTimes	-180.0	180.0	deg	The geodetic longitude at the center of the ground pixel	all
SolarAzimuthAngle	R4	nXtrack,nTimes	-180.0	+180.0	deg	The solar azimuth angle at the center of the ground pixel	all
SolarZenithAngle	R4	nXtrack,nTimes	0.0	180.0	deg	The solar zenith angle at the center of the ground pixel	all
SpacecraftAltitude	R4	nTimes	0.0e+00	1.0e+30	m	The altitude of the EOS-Aura satellite above WGS84 ellipsoid	all
TerrainHeight	I2	nXtrack,nTimes	-1000	10000	m	The terrain height at the center of the ground pixel	all
Time	R8	nTimes	0.0e+00	1.0e+10	s	The TAI93 time (in s) at the start of the swath line	all
TimeUTC	I2	nUTCdim,nTimes	0	9999	n/a	UTC value of the TAI93 time at the start of the "scan". UTC time of format of the UTC string YYYY-MM-DD hh:mm:ss is divided into 6 integer fields containing YYYY year (position 1) MM month (position 2) DD day (position 3) hh hours (position 4) mm minutes (position 5) ss seconds (position 6)	all
ViewingAzimuthAngle	R4	nXtrack,nTimes	-180.0	180.0	deg	The viewing azimuth angle ant the center of the ground pixel	all
ViewingZenithAngle	R4	nXtrack,nTimes	0.0	180.0	deg	The viewing zenith angle ant the center of the ground pixel	all

3. Data Fields

Name	Data Type	Dimension	Min. Value	Max Value	Units	Description	PGE
AirMassFactor	R8	nXtrack,nTimes	0.0e+00	1.0e+30	n/a	Molecule specific air mass factor for each ground pixel; in the case of HCHO including scattering weights, clouds, and vertical distribution of HCHO. In the OMOCLO product set to the geometric AMF.	all
AirMassFactorDiagnosticFlag	I2	nXtrack,nTimes	-2	13127	n/a	<p>Diagnostic flag for molecule specific air mass factor for each ground pixel. The flag indicates surface conditions and out of bound viewing geometry. Except for geometry and surface type, flag is computed additively, <i>i.e.</i>, it is the sum of all the conditions that apply to a ground pixel. Note that any of the cloud-related values below are applicable to OMHCHO only.</p> <p>Non-additive values</p> <ul style="list-style-type: none"> = -2 Out of bounds viewing geometry, no AMF computation possible = -1 No table lookup possible; geometric AMF used instead = 0-100 NISE snow cover fraction = 101 NISE permanent ice = 103 NISE dry snow = 104 NISE ocean = 125 NISE suspect (no snow cover assumed) = 127 NISE error (no snow cover assumed) <p>Additive values</p> <ul style="list-style-type: none"> + 1000 No OMI cloud fraction; use ISCCP climatology + 2000 No OMI cloud top height; use ISCCP climatology +10000 Sun glint possibility; assume albedo of ice 	all
AirMassFactorGeometric	R8	nXtrack,nTimes	0.0e+00	1.0e+30	n/a	Geometric air mass factor for the viewing geometry of each ground pixel	all
AMFCloudFraction	R4	nXtrack,nTimes	0.0	1.0	n/a	Cloud fraction from external cloud ESDT, adjusted such that it falls within the range of [0,1]. Some missing values replaced by ISCCP climatology	OMHCHO
AMFCloudPressure	R4	nXtrack,nTimes	0.0	1.0e+30	hPa	Cloud pressure from external cloud ESDT. Some missing values replaced by ISCCP climatology.	OMHCHO
AverageColumnAmount	R8	1	-1.0e+30	1.0e+30	mol/cm ²	Slant (OMOCLO) or total (OMBRO, OMHCHO) column amount averaged over the the whole granule ("good" data only; see <i>MainDataQualityFlag</i>)	all
AverageColumnUncertainty	R8	1	0.0e+00	1.0e+30	mol/cm ²	Slant (OMOCLO) or total (OMBRO, OMHCHO) column uncertainty averaged over the the whole granule ("good" data only; see <i>MainDataQualityFlag</i>)	all
AverageFittingRMS	R8	1	0.0e+00	1.0e+30	n/a	Fitting RMS averaged over the the whole granule ("good" data only; see <i>MainDataQualityFlag</i>)	all

Name	Data Type	Dimension	Min. Value	Max Value	Units	Description	PGE
ColumnAmount	R8	nXtrack,nTimes	-1.0e+30	1.0e+30	mol/cm ²	Slant (OMOCLO) or total (OMBRO, OMHCHO) column amount for each ground pixel	all
ColumnAmountDestriped (use is discouraged in v2.0 or higher)	R8	nXtrack,nTimes	-1.0e+30	1.0e+30	mol/cm ²	Slant (OMOCLO) or total (OMBRO, OMHCHO) column amount for each ground pixel after application of cross-track smoothing. USE IS DISCOURAGED IN V2.0 OR HIGHER	all
ColumnUncertainty	R8	nXtrack,nTimes	0.0e+00	1.0e+30	mol/cm ²	Slant (OMOCLO) or total (OMBRO, OMHCHO) column uncertainty for each ground pixel	all
FitConvergenceFlag	I2	nXtrack,nTimes	-12	12344	n/a	<p>The flag indicating the type of (non-)convergence of the non-linear least squares fitting routine associated with the ground pixel.</p> <p>Exit integer scalar that indicates why the return is taken:</p> <ul style="list-style-type: none"> =10000 convergence due to criterion no. 1 below = 2000 convergence due to criterion no. 2 below = 300 convergence due to criterion no. 3 below = 40 convergence due to criterion no. 4 below = x where x equals 0,1,2,3 or 4 < 0 indicates that no convergence criterion is fulfilled but some abnormal termination criterion is satisfied = -1 if $m < n$ or $n \leq 0$ or $m \leq 0$ or $mdc < m$ or $mdw < n * n + 5 * n + 3 * m + 6$ or $maxit \leq 0$ or $epsrel < 0$ or $epsabs < 0$ or $epsx < 0$ or invalid starting point on entry = -2 termination due to criterion no. 5 = -3 termination due to criterion no. 6 = -4 termination due to criterion no. 7 = -5 termination due to criterion no. 8 = -6 termination due to criterion no. 9 = -7 there is only one feasible point, namely $x(i) = bl(i) = bu(i)$; $i = 1, 2, \dots, n$ = -11 termination due to user stop indicator: fitting parameters out of bounds = -12 termination due to user stop indicator: "infinite loop" termination <p>The convergence criteria are:</p> <ol style="list-style-type: none"> 1) relative predicted reduction in the objective function is less than $epsrel^{**2}$ 2) the sum of squares is less than $epsabs^{**2}$ 3) the relative change in x is less than $epsx$ 4) we are computing at noise level the last digit in the convergence code (see below) indicates how the last steps were computed <ul style="list-style-type: none"> = 0 no trouble (gauss-newton the last 3 steps) = 1 prank < n at the termination point 	all

Name	Data Type	Dimension	Min. Value	Max Value	Units	Description	PGE
						<ul style="list-style-type: none"> = 2 the method of newton was used (at least) in the last step = 3 the 2nd but last step was subspace minimization but the last two were gauss-newton steps = 4 the steplength was not unit in both the last two steps <p>The abnormal termination criteria are:</p> <ul style="list-style-type: none"> 5) no. of iterations has exceeded maximum allowed iterations 6) the hessian emanating from 2nd order method is not pos def 7) the algorithm would like to use 2nd derivatives but is not allowed to do that 8) an undamped step with newtons method is a failure 9) the latest search direction computed using subspace minimization was not a descent direction (probably caused by wrongly computed Jacobian) <p>Convergence constants and dimension parameters:</p> <ul style="list-style-type: none"> maxit maximum number of allowed iterations tol pseudo rank tolerance constant epsrel relative convergence constant epsabs absolute convergence constant epsx parameter convergence constant n integer scalar containing the number of unknowns mdc integer scalar (mdc must be $\geq m$) m integer scalar containing the number of data points 	
FittingRMS	R8	nXtrack,nTimes	0.0	1.0e+30	n/a	Fitting RMS for each ground pixel	all
MainDataQualityFlag	I2	nXtrack,nTimes	-1	2	n/a	<p>Main flag to indicate data quality. Its main purpose is to give the user of the data an easy way to screen for suspect or bad pixels. The possible values are:</p> <ul style="list-style-type: none"> ≤ -1 <i>Missing</i>: No columns have been computed; entries are missing. = 0 <i>Good</i>: Column values are present and pass all quality checks. Data may be used with confidence = 1 <i>Suspect</i>:: Data should be used with caution because one or more of the following quality checks failed: <ul style="list-style-type: none"> (a) <i>FitConvergenceFlag</i> is < 300 (but ≥ 0) (b) <i>Column</i>+2σ uncertainty < 0.0 	all

Name	Data Type	Dimension	Min. Value	Max Value	Units	Description	PGE
						(but Column+3 σ uncertainty \geq 0.0) (c) Absolute column value > <i>MaximumColumnAmount</i> = 2 <i>Bad</i> : Data should not be used, or used with extreme caution, because one or more of the following conditions are present: (a) <i>FitConvergenceFlag</i> is < 0 (abnormal termination of fitting) (b) Column+3 σ uncertainty < 0.0	
MaximumColumnAmount	R8	1	0.0	1.0e+30	mol/cm ²	Maximum absolute column amount up to which fitted columns qualify as "good" and beyond which they are considered "suspect" (see <i>MainDataQualityFlag</i>)	
PixelCornerLatitudes	R4	nXtrack+1, nTimes+1	-90.0	90.0	deg	The geodetic latitudes of the corner coordinates of the OMI ground pixels	all
PixelCornerLongitudes	R4	nXtrack+1, nTimes+1	-180.0	180.0	deg	The geodetic longitudes of the corner coordinates of the OMI ground pixels	all
RadianceReferenceColumnAmount	R8	nXtrack	-1.0e+30	1.0e+30	mol/cm ²	Slant column amount for each ground pixel in the reference swath line	all
RadianceReferenceColumnUncertainty	R8	nXtrack	0.0e+00	1.0e+30	mol/cm ²	Slant column amount uncertainty for each ground pixel in the reference swath line	all
RadianceReferenceColumnXTRFit	R8	nXtrack	-1.0e+30	1.0e+30	mol/cm ²	Cross-track fit to RadianceReferenceColumnAmount that is removed from the radiance reference spectrum in cases where the removal of the target gas from the reference spectrum has been selected	all
RadianceReferenceConvergenceFlag	I4	nXtrack	-10	12344	n/a	The flag indicating the type of (non-) convergence of the non-linear least squares fitting routine for the radiance reference fit. See also <i>FitConvergenceFlag</i>	all
RadianceReferenceFittingRMS	R8	nXtrack	0.0e+00	1.0e+30	n/a	Fitting RMS for each ground pixel in the radiance reference line	all
RadianceReferenceLatitudeRange	R4	2	-90.0	+90.0	n/a	Lower and upper latitude values defining the range that went into the composition of the radiance reference spectrum. If equal, a single swath line was used with average latitude value closest to the specified latitudes.	all
RadianceWavCalConvergenceFlag	I2	nXtrack	-10	12344	n/a	The flag indicating the type of (non-) convergence of the non-linear least squares fitting routine for the radiance wavelength calibration. For a detailed description of the flag refer to <i>FitConvergenceFlag</i>	all
RadianceWavCalLatitudeRange	R4	2	-90.0	90.0	n/a	Lower and upper latitude values defining the range that went into the composition of the radiance spectrum used for wavelength calibration. If equal, a single swath line was used with average latitude value closest to the specified latitudes.	all
SolarWavCalConvergenceFlag	I2	nXtrack	-10	12344	n/a	The flag indicating the type of (non-) convergence of the non-linear least squares fitting routine for the solar wavelength calibration. For a detailed description of the flag refer to <i>FitConvergenceFlag</i> .	all