Atmospheric Composition Variable Standard Name Recommendations

May 9, 2022

1 Overview

In the ICARTT V2.0 file format standard an additional variable definition, called a standard variable name, is now required in an effort to improve usability, standardization, and machine-readability. The standard variable name is designed to be a tag used along with the PI-generated data product variable short name. This document recommends a set of guidelines for creating standard variable names for different types of measurements and provides a list of standard variable names that cover the current list of measurements conducted during the suborbital field studies on atmospheric composition.

The proposed standard names are constructed using controlled vocabulary terms with four parts: measurement category (MeasurementCategory), core name (CoreName), acquisition method (AcquisitionMethod), and descriptive attributes (DescriptiveAttributes), which are separated by an underscore:

Standard Name = MeasurementCategory_CoreName_AcquisitionMethod_DescriptiveAttributes

This structure is similar to that of the Climate and Forecast Metadata Convention (CF) and the Geoscience Standard Names (GSN) ontology. It is designed to support data discovery, distribution, interoperability, and use, by accurately describing all variables from different measurements/instruments while using a consistent format for interoperability. For data discovery, the MeasurementCategory and CoreName can be used to conduct a broad search to identify all measurements of the same physical quantity from different instruments and/or field studies. The DescriptiveAttributes can then be used to narrow down the search for data of interest. As discussed in later sections, the number and nature of DescriptiveAttributes are dependent on the type of measurement. The DescriptiveAttributes can also provide additional description necessary for research use of data. The AcquisitionMethod identifies the sampling technique used for the measurement.

1.1 MeasurementCategory

MeasurementCategory broadly groups all measurement standard names into one of thirteen categories. Additionally, it provides uniqueness when using only CoreNames could be ambiguous (e.g., a particle number concentration could be describing cloud or aerosol particles). Within each MeasurementCategory, the format of each standard name is consistent (i.e. variable standard names within each category have the same number and type of descriptive attributes). The types and/or number of attributes have been tailored to each type of measurement (e.g., aerosol particle optical property vs. aerosol particle composition) or medium (e.g., trace gas vs. aerosol particle); therefore, MeasurementCategory is defined by the measurement medium and type of measurements. See Table 1 for the complete list of MeasurementCategories. The variable standard names for each MeasurementCategory are introduced in Section 2.

Table 1: List of Values for MeasurementCategory

MeasurementCategory	**Description**	**Number of Descriptive Attributes**
Gas	Trace gases properties, e.g., abundance and isotope ratios	2
AerComp	Aerosol particle composition	3
AerMP	Aerosol particle microphysical properties	4
AerOpt	Aerosol particle optical properties	4
CldComp	Cloud particle composition	3
CldMicro	Cloud particle microphysical properties	3
CldMacro	Cloud macrophysical properties	0*
CldOpt	Cloud optical properties	1
Met	Meteorology parameters	0*
GasJValue	Gas phase photolytic rate coefficients	3
AquJValue	Aqueous phase photolytic rate coefficients	3
Platform	Measurement platform (e.g., aircraft, ship, motor vehicles) navigation and attitude	0*
Rad	Radiation measurements	1

* While no descriptive attributes exist for these measurement categories, '_None' must be used in place of the DescriptiveAttribute.

1.2 CoreName

The CoreName is the basic identification of the physical quantity being reported. The CoreNames chosen are those that have been commonly used in literature, which are, by definition, "community acceptable".

1.3 AcquisitionMethod

The AcquisitionMethod refers to the sampling technique of the measurement. The modes chosen are similar to the ESA Atmospheric Validation Data Centre (EVDC) acquisition method

metadata attributes, which are InSitu, Numerical Simulation, Remote Sensing, and Sample. The complete list is given in Table 2.

Table 2: List of Values for AcquisitionMethod

AcquisitionMethod	**Description**
InSitu	Sampling in close proximity of the instrument or the sampling platform
VertCol	Measurement of a remotely sensed vertically integrated column, where the column measured is nominally perpendicular to the earth's surface
SlantCol	Measurement of a remotely sensed vertically integrated column, where the column measured is not nominally perpendicular to the earth's surface (e.g. the instrument is sun-tracking)
Profile	Measurement of vertically resolved profile

1.4 DescriptiveAttributes

The descriptive attributes provide measurement and/or data reporting information relevant for data use and faceted data search, particularly when comparing results obtained with other methods of observations. The number and types of descriptive attributes are measurement-dependent; the attributes required for each MeasurementCategory can be found in their respective sections below. For certain measurements, DescriptiveAttributes may not be necessary. In this case, "None" will be used as the value for this attribute.

The following sections detail the controlled vocabulary for CoreNames and DescriptiveAttributes pertaining to each MeasurementCategory.

2 Standard Variable Names

2.1 Trace Gas Standard Names

The MeasurementCategory for trace gas is "Gas". The associated descriptive attributes are "MeasurementSpecificity" and "Reporting". The "MeasurementSpecificity" attribute specifies whether the CoreName represents a single species (S), combination of multiple species (M), or is not applicable (NA) for a gas phase reaction rate or ratio of species. The "Reporting" attribute describes the way a trace gas is reported, which are defined in Table 3. When reporting in standard temperature and pressure (STP), the temperature and pressure conditions under which the measurement is reported must be noted in the header or metadata of the data file, as "standard temperature" varies across the research community.

Table 3: Trace Gas Measurement Reporting Attributes

Reporting Attributes	**Description**
DVMR	Volumetric mixing ratio with respect to dry air (i.e., no water vapor)
AVMR	Volumetric mixing ratio with respect to ambient air
DMF	Molar fraction with respect to dry air
AMF	Molar fraction with respect to ambient air
ConcSTP	Number or mass concentration reported at standard temperature and pressure
ConcAMB	Number or mass concentration reported at ambient temperature and pressure
CNDAMB	Column integrated number density reported at ambient temperature and pressure
d13C	Deviations in the $^{13}C/^{12}C$ Stable Carbon Isotope Ratio relative to a standard
d14C	Deviations in the $^{14}C/^{12}C$ Carbon Isotope Ratio relative to a standard
dD	Deviations in the D/H Stable Hydrogen Isotope Ratio relative to a standard
d18O	Deviations in the $^{18}O/^{16}O$ Stable Oxygen Isotope Ratio relative to a standard

The CoreNames for trace gas measurements are given in Table 4. The names of specific species are a combination of chemical formulas and chemical names. The chemical names used for volatile organic carbon species follow a standard nomenclature, which has been agreed upon by multiple measurement groups. In addition, most of these names are linked to Chemical Abstracts Service (CAS) numbers, which are unique for each chemical compound. Each CoreName has a corresponding MeasurementSpecificity (S, M, or NA).

In certain cases, some instruments do not have sufficient selectivity to measure individual specific trace gas species. These data are reported as the sum of multiple species or a group of species. For these lumped measurements, the core names are either those used in literature (e.g., NOy, PNs) or a combination of names for specific compounds (e.g., iButeneAnd1Butene for the sum of Isobutene and 1-Butene).

The following example provides the controlled vocabulary options for AcquisitionMethod, MeasurementSpecificity, and Reporting attribute that can be used in a trace gas standard name.

Trace Gases
Gas_CoreName_AcquisitionMethod_MeasurementSpecificity_Reporting
AcquisitionMethod = InSitu, VertCol, SlantCol, Profile
MeasurementSpecificity* = S (single species), M (multiple species), NA (not applicable)
Reporting = DVMR, AVMR, DMF, AMF, ConcSTP, ConcAMB, CNDAMB, d13C, d14C, dD, d18O
*Measurement Specificity corresponding to each CoreName can be found in Table 4

Example for an in-situ measurement of CO2 gas reported in molar fraction with respect to dry air: Gas_CO2_InSitu_S_DMF

Example for an in-situ measurement of total reactive nitrogen species reported in volumetric mixing ratio with respect to ambient air: Gas_NOy_InSitu_M_AVMR

Example for a remote sensing measurement of slant column NO2 gas reported column number density with respect to ambient air: Gas_NO2_SlantColumn_S_CNDAMB

Table 4 provides a list of trace gas CoreNames, along with definition, chemical formula, CAS number, and MeasurementSpecificity. For convenience, 7 subgroups are used to categorize the variables: Oxygen Species, Hydrogen Species and Radicals; Nitrogen Species; Sulfur Species; Halogens and Halogenates; Hydrocarbons: Alkanes, Alkenes, and Alkynes; Hydrocarbons: Aromatics; and Oxygenated Inorganic and Volatile Organic Carbon Species, similar to the terms used in the Global Change Master Directory (GCMD).

Table 4: List of Trace Gas CoreNames and Definitions

CoreName	**Definition**	**Chemical Formula**	**CAS Number**	**Specificity**
Oxygen Species, Hydrogen Species and Radicals				
H2	Hydrogen	H_2	1333-74-0	S
O2	Oxygen	O_2	7782-44-7	S
O2toN2ratio	Ratio of Oxygen to Nitrogen	N/A	N/A	NA
APO	Atmospheric Potential Oxygen (O_2 + 1.1 x (CO_2 - 350))	N/A	N/A	NA
HO2	Hydroperoxy radical	HO_2	3170-83-0	S
CH3O2	Methylperoxy radical	CH_3O_2	2143-58-0	S
RO2	Sum of Organic Peroxy radicals	N/A	N/A	M
HO2AndRO2	Sum of Hydroperoxy radical and Organic Peroxy radicals	N/A	N/A	M
OH	Hydroxyl radical	OH	3352-57-6	S
OHR	OH Reactivity	N/A	N/A	NA

CoreName	Definition	Chemical Formula	CAS Number	Specificity
H2O2	Hydrogen peroxide	H_2O_2	7722-84-1	S
O3	Ozone	O_3	10028-15-6	S
O1D	O(1D)	O		S
O3P	O(3P)	O		S
H	Hydrogen atom	H	12385-13-6	S
HCO	Formyl radical	HCO	2597-44-6	S
CH3	Methyl radical	CH_3	2229-07-4	S
CH3O	Methoxy radical	CH_3O	2143-68-2	S
C2H5O	Ethoxy radical	C_2H_5O	2154-50-9	S
CH3COO2	Peroxyacetyl radical	$C_2H_3O_3$	36709-10-1	S
CH3COO	Acetoxy radical	$C_2H_3O_2$	N/A	S
CH3CH2	Ethyl radical	C_2H_5	2025-56-1	S
CH3CO	Acetyl radical	C_2H_3O	3170-69-2	S
Nitrogen Species				
NH3	Ammonia	NH_3	7664-41-7	S
NF3	Nitrogen trifluoride	NF_3	7783-54-2	S
N2O	Nitrous oxide	N_2O	10024-97-2	S
NO	Nitric oxide	NO	10102-43-9	S
NO2	Nitrogen dioxide	NO_2	10102-44-0	S
NO3	Nitrate radical	NO_3	12033-49-7	S
N2O5	Nitrogen pentoxide	N_2O_5	10102-03-01	S
HNO2	Nitrous acid	HNO_2	7782-77-6	S
HNO3	Nitric acid	HNO_3	7697-37-2	S
HNO4	Peroxynitric acid	HNO_4	26404-66-0	S
HCN	Hydrogen cyanide	HCN	74-90-8	S
CH3CN	Acetonitrile	C_2H_3N	75-05-8	S
HNCO	Isocyanic acid	HNCO	75-13-8	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
Acrylonitrile	Acrylonitrile	C_3H_3N	107-13-1	S
MeAcrylonitrile	Methylacrylonitrile	C_4H_5N	126-98-7	S
PropNitrile	Propanenitrile	C_3H_5N	107-12-0	S
BenzNitrile	Benzonitrile	C_7H_5N	100-47-0	S
Pyrrole	Pyrrole	C_4H_5N	109-97-7	S
C4H5N	Sum of C4H5N isomers	C_4H_5N	N/A	M
Pyridine	Pyridine	C_5H_5N	110-86-1	S
Nitromethane	Nitromethane	CH_3NO_2	75-52-5	S
ClNO2	Nitryl chloride	$ClNO_2$	13444-90-1	S
ClONO2	Chlorine nitrate	$ClNO_3$	14545-72-3	S
MeONO2	Methyl nitrate	CH_3NO_3	598-58-3	S
EthONO2	Ethyl nitrate	$C_2H_5NO_3$	625-58-1	S
nPropONO2	n-Propyl nitrate	$C_3H_7NO_3$	627-13-4	S
iPropONO2	Isopropyl nitrate	$C_3H_7NO_3$	1712-64-7	S
nButONO2	n-Butyl nitrate	$C_4H_9NO_3$	928-45-0	S
x2ButONO2	2-Butyl nitrate	$C_4H_9NO_3$	924-52-7	S
iButONO2	Isobutyl nitrate	$C_4H_9NO_3$	543-29-3	S
iButONO2And2ButONO2	Sum of Isobutyl nitrate and 2-Butyl nitrate	$C_4H_9NO_3$	N/A	M
tButONO2	t-Butyl nitrate	$C_4H_9NO_3$	0926-05-06	S
nPentONO2	n-Pentyl nitrate	$C_5H_{11}NO_3$	1002-16-0	S
x2PentONO2	2-Pentyl nitrate	$C_5H_{11}NO_3$	21981-48-6	S
x3PentONO2	3-Pentyl nitrate	$C_5H_{11}NO_3$	N/A	S
iPentONO2	Isopentyl nitrate	$C_5H_{11}NO_3$	543-87-3	S
x3Me2ButONO2	3-Methyl-2-butyl nitrate	$C_5H_{11}NO_3$	N/A	S
x2OxoEthONO2	2-Oxoethyl nitrate	$C_2H_3NO_4$	72673-15-5	S
AcetylONO2	Acetyl nitrate	$C_2H_3NO_4$	591-09-3	S
PAN	Peroxyacetyl nitrate	$C_2H_3NO_5$	2278-22-0	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
APAN	Peroxyacryloyl nitrate	$C_3H_3NO_5$	N/A	S
PPN	Peroxylpropionyl nitrate	$C_3H_5NO_5$	5796-89-4	S
PBN	Peroxybutyryl nitrate	$C_4H_7NO_5$	N/A	S
PiBN	Peroxyisobutyric nitrate	$C_4H_7NO_5$	N/A	S
PPeN	Peroxypentyryl nitrate	$C_5H_9NO_5$	N/A	M
PBzN	Peroxybenzoyl nitrate	$C_7H_5NO_5$	N/A	S
MoPN	Methoxy Peroxyacetyl nitrate	$C_2H_6NO_6$	N/A	S
MPAN	Peroxymethacryloyl nitrate	$C_4H_5NO_5$	N/A	S
PNs	Sum of Peroxynitrates	N/A	N/A	M
ANs	Sum of Akylnitrates	N/A	N/A	M
NOx	Nitrogen oxides (NO + NO2)	N/A	N/A	M
NOy	Total Reactive Nitrogen	N/A	N/A	M
NOyasNO2	Total Reactive Nitrogen Converted to NO2	N/A	N/A	M
NOyasNO	Total Reactive Nitrogen Converted to NO	N/A	N/A	M
x2HydEthONO2	2-Hydroxyethyl nitrate	$C_2H_5NO_4$	16051-48-2	S
C3H7NO4	Sum of C3H7NO4 Hydroxy nitrates	$C_3H_7NO_4$	N/A	M
C3H5NO4	Sum of C3H5NO4 Carbonyl nitrates	$C_3H_5NO_4$	N/A	M
C4H7NO4	Sum of C4H7NO4 Isomers	$C_4H_7NO_4$	N/A	M
C4H7NO5	Sum of Isomers, including C4 Hydroxy Carbonyl Nitrates	$C_4H_7NO_5$	N/A	M
C4H9NO4	Sum of C4H9NO4 Hydroxy nitrates	$C_4H_9NO_4$	N/A	M
ISOPN	Sum of Isoprene Hydroxy Nitrate Isomers	$C_5H_9NO_4$	N/A	M
C5H9NO5	Sum of C5H9NO5 Isomers, including Hydroperoxy Nitrates of Isoprene	$C_5H_9NO_5$	N/A	M
NitroCatechol	Nitrocatechol, aka 4-nitrocatechol	$C_6H_5NO_4$	3316-09-04	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
NitroGuaiacol	Nitroguaiacol, including 4-Nitroguaiacol and 5-Nitroguaiacol	$C_7H_7NO_4$	N/A	M
x4NitroGuaiacol	4-Nitroguaiacol	$C_7H_7NO_4$	3251-56-7	S
x5NitroGuaiacol	5-Nitroguaiacol	$C_7H_7NO_4$	636-93-1	S
Silicon Species				
C10H30O5Si5	Decamethylcyclopentasiloxane	$C_{10}H_{30}O_5Si_5$	541-02-6	S
Sulfur Species				
CS2	Carbon disulfide	CS_2	75-15-0	S
CH3SH	Methanethiol	CH_4S	74-93-1	S
DMS	Dimethyl sulfide	C_2H_6S	75-18-3	S
DMDS	Dimethyl disulfide	$C_2H_6S_2$	624-92-0	S
DMSO	Dimethyl sulfoxide	C_2H_6OS	67-68-5	S
DMSO2	Dimethyl sulfone	$C_2H_6O_2S$	67-71-0	S
H2SO4	Sulfuric acid	H_2SO_4	7664-93-9	S
MSA	Methanesulfonic acid	CH_4O_3S	75-75-2	S
OCS	Carbonyl sulfide	OCS	463-58-1	S
SF6	Sulfur hexafluoride	SF_6	2551-62-4	S
C2H4O3S	Sum of C2H4O3S isomers	$C_2H_4O_3S$	N/A	M
SO2F2	Sulfuryl fluoride	SO_2F_2	2699-79-8	S
SO2	Sulfur dioxide	SO_2	7446-09-05	S
HPMTF	Hydroperoxymethyl thioformate	$C_2H_3O_3S$	N/A	S
Halogens and Halogenates				
Cl	Chlorine atom	Cl	22537-15-1	S
HCl	Hydrogen chloride	HCl	7647-01-0	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
Cl2	Chlorine	Cl_2	7782-50-5	S
ClO	Chlorine monoxide	ClO	14989-30-1	S
HOCl	Hypochlorous acid	HOCl	7790-92-3	S
Br	Bromine atom	Br	10097-32-2	S
HBr	Hydrogen bromide	HBr	10035-10-6	S
Br2	Bromine	Br_2	7726-95-6	S
BrCl	Bromine chloride	BrCl	13863-41-7	S
BrO	Bromine monoxide	BrO	15656-19-6	S
BrONO	Bromine nitrite	$BrNO_2$	N/A	S
BrONO2	Bromine nitrate	$BrNO_3$	40423-14-1	S
$BrNO_2$	Bromine nitrite	$BrNO_2$	N/A	S
HOBr	Hypobromous acid	HOBr	13517-11-8	S
Br2AndHOBr	Sum of HOBr and Br_2	N/A	N/A	M
Br2O	Dibromine monoxide	Br_2O	21308-80-5	S
BrCN	Cyanogen Bromide	BrCN	506-68-3	S
I	Iodine atom	I	14362-44-8	S
I2	Iodine	I_2	7553-56-2	S
IO	Iodine monoxide	IO	14696-98-1	S
HOI	Hypoiodous acid	HIO	14332-21-9	S
CH3COOCl	Chloroacetic acid	$C_2H_3ClO_2$	79-11-8	S
CH3Cl	Chloromethane	CH_3Cl	74-87-3	S
CH2Cl2	Dichloromethane	CH_2Cl_2	75-09-2	S
CHCl3	Chloroform	$CHCl_3$	67-66-3	S
CCl4	Tetrachloromethane	CCl_4	56-23-5	S
C2H5Cl	Chloroethane	C_2H_5Cl	75-00-3	S
CH3CHCl2	1,1-Dichloroethane	$C_2H_4Cl_2$	75-34-3	S
CH2ClCH2Cl	1,2-Dichloroethane	$C_2H_4Cl_2$	107-06-02	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
CH3CCl3	Methyl chloroform; 1,1,1-Trichloroethane	$C_2H_3Cl_3$	71-55-6	S
CHCl2CH2Cl	1,1,2-Trichloroethane	$C_2H_3Cl_3$	79-00-5	S
CHCl2CHCl2	1,1,2,2-Tetrachloroethane	$C_2H_2Cl_4$	79-34-5	S
C2H3Cl	Chloroethene	C_2H_3Cl	75-01-4	S
tCHClCHCl	trans-1,2-Dichloroethene	$C_2H_2Cl_2$	156-60-5	S
cCHClCHCl	cis-1,2-Dichloroethene	$C_2H_2Cl_2$	156-59-2	S
CCl2CH2	1,1-Dichloroethene	$C_2H_2Cl_2$	75-35-4	S
C2HCl3	Trichloroethene	C_2HCl_3	79-01-6	S
C2Cl4	Tetrachloroethene	C_2Cl_4	127-18-4	S
x12DiClPropane	1,2-Dichloropropane	$C_3H_6Cl_2$	78-87-5	S
x123TriClPropane	1,2,3-Trichloropropane	$C_3H_5Cl_3$	96-18-4	S
x13DiClPropene	1,3-Dichloropropene	$C_3H_4Cl_2$	542-75-6	S
x23DiCl1Propene	2,3-Dichloro-1-propene	$C_3H_4Cl_2$	78-88-6	S
HexClButadiene	Hexachlorobutadiene	C_4Cl_6	87-68-3	S
ClBenzene	Chlorobenzene	C_6H_5Cl	108-90-7	S
pDiClBenzene	1,4-Dichlorobenzene	$C_6H_4Cl_2$	106-46-7	S
mDiClBenzene	1,3-Dichlorobenzene	$C_6H_4Cl_2$	541-73-1	S
oDiClBenzene	1,2-Dichlorobenzene-	$C_6H_4Cl_2$	95-50-1	S
x124TriClBenzene	1,2,4-Trichlorobenzene	$C_6H_3Cl_3$	120-82-1	S
x123TriClBenzene	1,2,3-Trichlorobenzene	$C_6H_3Cl_3$	87-61-6	S
x135TriClBenzene	1,3,5-Trichlorobenzene	$C_6H_3Cl_3$	108-70-3	S
aClToluene	Benzyl chloride	C_7H_7Cl	100-44-7	S
oClToluene	1-Chloro-2-methylbenzene	C_7H_7Cl	95-49-8	S
pClToluene	1-Chloro-4-methylbenzene	C_7H_7Cl	95-49-8	S
mClToluene	1-Chloro-3-methylbenzene	C_7H_7Cl	108-41-8	S
CH3Br	Bromomethane	CH_3Br	74-83-9	S
CH2Br2	Dibromomethane	CH_2Br_2	74-95-3	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
CHBr3	Bromoform	$CHBr_3$	75-25-2	S
C2H5Br	Bromoethane	C_2H_5Br	74-96-4	S
CH2BrCH2Br	1,2-Dibromoethane	$C_2H_4Br_2$	106-93-4	S
nC3H7Br	n-Propyl bromide	C_3H_7Br	106-94-5	S
BrBenzene	Bromobenzene	C6H5Br	108-86-1	S
CH3I	Iodomethane	CH_3I	74-88-4	S
CH2I2	Diiodomethane	CH_2I_2	75-11-6	S
C2H5I	Iodoethane	C_2H_5I	75-03-6	S
CH2BrCl	Bromochloromethane	CH_2BrCl	74-97-5	S
CHBr2Cl	Dibromochloromethane	$CHBr_2Cl$	124-48-1	S
CHBrCl2	Bromodichloromethane	$CHBrCl_2$	75-27-4	S
CH2BrCHBrCH2Cl	1,2-Dibromo-3-chlorobenzene	$C_3H_5Br_2Cl$	96-12-8	S
CH2ClI	Chloroiodomethane	CH_2ClI	593-71-5	S
CH2BrI	Bromoiodomethane	CH_2BrI	557-68-6	S
CFC11	Trichlorofluoromethane	CCl_3F	75-69-4	S
CFC12	Dichlorodifluoromethane	CCl_2F_2	75-71-8	S
CFC13	Chlorotrifluoromethane	$CClF_3$	75-72-9	S
CF4	Tetrafluoromethane	CF_4	75-73-0	S
CFC112	Tetrachloro-1,2-difluoroethane	$C_2Cl_4F_2$	76-12-0	S
CFC113	1,1,2-Trichlorotrifluoroethane	$C_2Cl_3F_3$	76-13-1	S
CFC114	1,2-Dichlorotetrafluoroethane	$C_2Cl_2F_4$	76-14-2	S
CFC115	Chloropentafluoroethane	C_2ClF_5	76-15-3	S
C2F6	Hexafluoroethane	C_2F_6	76-16-4	S
pClBenzoTriF	1-Chloro-4-(trifluoromethyl)benzene (PCBTF)	$C_7H_4ClF_3$	98-56-6	S
H1202	Dibromodifluoromethane	CBr_2F_2	75-61-6	S
H1211	Bromochlorodifluoromethane	$CBrClF_2$	353-59-3	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
H1301	Bromotrifluoromethane	$CBrF_3$	75-63-8	S
H2402	1,2-Dibromotetrafluoroethane	$C_2Br_2F_4$	124-73-2	S
HCFC123	1,1-Dichloro-2,2,2-trifluoroethane	$C_2HCl_2F_3$	306-83-2	S
HCFC124	1-Chloro-1,2,2,2-tetrafluoroethane	C_2HClF_4	2837-89-0	S
HCFC141b	1,1-Dichloro-1-fluoroethane	$C_2H_3Cl_2F$	1717-00-6	S
HCFC142b	1-Chloro-1,1-difluoroethane	$C_2H_3ClF_2$	75-68-3	S
HCFC133a	1-Chloro-2,2,2-trifluoroethane	$C_2H_2ClF_3$	75-88-7	S
HCFC21	Dichlorofluoromethane	$CHCl_2F$	75-43-4	S
HCFC22	Chlorodifluoromethane	$CHClF_2$	75-45-6	S
HFC125	Pentafluoroethane	C_2HF_5	354-33-6	S
HFC134a	1,1,1,2-Tetrafluoroethane	$C_2H_2F_4$	811-97-2	S
HFC143a	1,1,1-Trifluoroethane	$C_2H_3F_3$	420-46-2	S
HFC152a	1,1-Difluoroethane	$C_2H_4F_2$	75-37-6	S
C3F8	Octafluoropropane	C_3F_8	76-19-7	S
HFC23	Trifluoromethane	CHF_3	75-46-7	S
HFC227ea	1,1,1,2,3,3,3-Heptafluoropropane	C_3HF_7	431-89-0	S
HFC32	Difluoromethane	CH_2F_2	75-10-5	S
HFC365mfc	1,1,1,3,3-Pentafluorobutane	$C_4H_5F_5$	406-58-6	S
HFC236fa	1,1,1,3,3,3-Hexafluoropropane	$C_3H_2F_6$	690-39-1	S
Hydrocarbons: Alkanes, Alkenes, and Alkynes				
CH4	Methane	CH_4	74-82-8	S
x13CH4	^{13}CH4-Methane	$^{13}CH_4$	14762-74-4	S
x14CH4	^{14}CH4-Methane	$^{14}CH_4$	2772-68-1	S
CH3D	CH3D-Methane	CH_3D	676-49-3	S
Ethane	Ethane	C_2H_6	74-84-0	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
Ethene	Ethene	C_2H_4	74-85-1	S
Ethyne	Ethyne	C_2H_2	74-86-2	S
Propane	Propane	C_3H_8	74-98-6	S
Propene	Propene	C_3H_6	0115-07-01	S
Propyne	Propyne	C_3H_4	74-99-7	S
Propadiene	Propadiene	C_3H_4	463-49-0	S
nButane	n-Butane	C_4H_{10}	106-97-8	S
iButane	Isobutane	C_4H_{10}	75-28-5	S
iButene	Isobutene	C_4H_8	0115-11-7	S
x1Butene	1-Butene	C_4H_8	106-98-9	S
iButeneAnd1Butene	Sum of Isobutene and 1-Butene	C_4H_8	N/A	M
c2Butene	cis-2-Butene	C_4H_8	590-18-1	S
t2Butene	trans-2-Butene	C_4H_8	624-64-6	S
CycButane	Cyclobutane	C_4H_8	287-23-0	S
x13Butadiene	1,3-Butadiene	C_4H_6	106-99-0	S
x12Butadiene	1,2-Butadiene	C_4H_6	590-19-2	S
x1Butyne	1-Butyne	C_4H_6	107-00-6	S
x2Butyne	2-Butyne	C_4H_6	503-17-3	S
x1Buten3yne	1-Buten-3-yne	C_4H_4	689-97-4	S
x13Butadiyne	1,3-Butadiyne	C_4H_2	460-12-8	S
nPentane	n-Pentane	C_5H_{12}	109-66-0	S
iPentane	Isopentane	C_5H_{12}	78-78-4	S
Neopentane	Neopentane	C_5H_{12}	463-82-1	S
x1Pentene	1-Pentene	C_5H_{10}	109-67-1	S
c2Pentene	cis-2-Pentene	C_5H_{10}	627-20-3	S
t2Pentene	trans-2-Pentene	C_5H_{10}	0646-04-08	S
x2Me1Butene	2-Methyl-1-butene	C_5H_{10}	563-46-2	S
x3Me1Butene	3-Methyl-1-butene	C_5H_{10}	563-45-1	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
x2Me2Butene	2-Methyl-2-butene	C_5H_{10}	513-35-9	S
CycPentane	Cyclopentane	C_5H_{10}	287-92-3	S
CycPentene	Cyclopentene	C_5H_8	142-29-0	S
Z13Pentadiene	(Z)-1,3-Pentadiene	C_5H_8	1574-41-0	M
E13Pentadiene	(E)-1,3-Pentadiene	C_5H_8	2004-70-8	M
x13Pentadienes	Sum of (E)-1,3-Pentadiene and (Z)-1,3-Pentadiene	C_5H_8	504-60-9	M
Isoprene	Isoprene	C_5H_8	78-79-5	S
IsopreneAndFuran	Sum of Isoprene and Furan	N/A	N/A	M
nHexane	n-Hexane	C_6H_{14}	110-54-3	S
x2MePentane	2-Methylpentane	C_6H_{14}	107-83-5	S
x3MePentane	3-Methylpentane	C_6H_{14}	96-14-0	S
MePentanes	Sum of 2-Methylpentane and 3-Methylpentane	C_6H_{14}	N/A	M
x22DimeButane	2,2-Dimethylbutane	C_6H_{14}	75-83-2	S
x23DimeButane	2,3-Dimethylbutane	C_6H_{14}	79-29-8	S
x1Hexene	1-Hexene	C_6H_{12}	592-41-6	S
x2Me1Pentene	2-Methyl-1-pentene	C_6H_{12}	763-29-1	S
x32Me1Pentene	3-Methyl-1-pentene	C_6H_{12}	760-20-3	S
x4Me1Pentene	4-Methyl-1-pentene	C_6H_{12}	691-37-2	S
x3Me1PenteneAnd4Me1Pentene	Sum of 3-Methyl-1-pentene and 4-Methyl-1-pentene	C_6H_{12}	N/A	M
x2Me2Pentene	2-Methyl-2-pentene	C_6H_{12}	625-27-4	S
Z3Me2Pentene	(Z)-3-Methyl-2-pentene	C_6H_{12}	922-62-3	S
E3Me2Pentene	(E)-3-Methyl-2-pentene	C_6H_{12}	616-12-6	S
x3Me2Pentenes	Sum of (Z)-3-Methyl-2-pentene and (E)-3-Methyl-2-pentene	C_6H_{12}	922-61-2	M
Z4Me2Pentene	(Z)-4-Methyl-2-pentene	C_6H_{12}	691-38-3	S
E4Me2Pentene	(E)-4-Methyl-2-pentene	C_6H_{12}	674-76-0	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
x4Me2Pentenes	Sum of (Z)-4-Methyl-2-pentene and (E)-4-Methyl-2-pentene	C_6H_{12}	4461-48-7	M
CycHexane	Cyclohexane	C_6H_{12}	110-82-7	S
MeCycPentane	Methylcyclopentane	C_6H_{12}	96-37-7	S
nHeptane	n-Heptane	C_7H_{16}	142-82-5	S
x2MeHexane	2-Methylhexane	C_7H_{16}	591-76-4	S
x3MeHexane	3-Methylhexane	C_7H_{16}	589-34-4	S
x22DimePentane	2,2-Dimethylpentane	C_7H_{16}	590-35-2	S
x23DimePentane	2,3-Dimethylpentane	C_7H_{16}	565-59-3	S
x24DimePentane	2,4-Dimethylpentane	C_7H_{16}	108-08-07	S
x33DimePentane	3,3-Dimethylpentane	C_7H_{16}	562-49-2	S
x1Heptene	1-Heptene	C_7H_{14}	592-76-7	S
MeCycHexane	Methylcyclohexane	C_7H_{14}	108-87-2	S
nOctane	n-Octane	C_8H_{18}	111-65-9	S
x224TrimePentane	2,2,4-Trimethylpentane	C_8H_{18}	540-84-1	S
x234TrimePentane	2,3,4-Trimethylpentane	C_8H_{18}	565-75-3	S
x2MeHeptane	2-Methylheptane	C_8H_{18}	592-27-8	S
x3MeHeptane	3-Methylheptane	C_8H_{18}	589-81-1	S
x1Octene	1-Octene	C_8H_{16}	111-66-0	S
nNonane	n-Nonane	C_9H_{20}	111-84-2	S
x1Nonene	1-Nonene	C_9H_{18}	124-11-8	S
aPinene	alpha-Pinene	$C_{10}H_{16}$	80-56-8	S
bPinene	beta-Pinene	$C_{10}H_{16}$	127-91-3	S
Camphene	Camphene	$C_{10}H_{16}$	79-92-5	S
Tricyclene	Tricyclene	$C_{10}H_{16}$	508-32-7	S
aTerpinene	alpha-Terpinene	$C_{10}H_{16}$	99-86-5	S
gTerpinene	gamma-Terpinene	$C_{10}H_{16}$	99-85-4	S
Myrcene	Myrcene	$C_{10}H_{16}$	123-35-3	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
Limonene	Limonene	$C_{10}H_{16}$	138-86-3	S
LimoneneAndD3Carene	Sum of Limonene and Δ3-Carene	$C_{10}H_{16}$	N/A	M
bPineneAndMyrcene	Sum of beta-Pinene and Myrcene	$C_{10}H_{16}$	N/A	M
Sabinene	Sabinene	$C_{10}H_{16}$	3387-41-5	S
dLimonene	D-Limonene	$C_{10}H_{16}$	5989-27-5	S
Terpinolene	Terpinolene	$C_{10}H_{16}$	586-62-9	S
Monoterpenes	Sum of Monoterpenes	$C_{10}H_{16}$	N/A	M
nDecane	n-Decane	$C_{10}H_{22}$	124-18-5	S
x1Decene	1-Decene	$C_{10}H_{20}$	872-05-9	S
nUndecane	n-Undecane	$C_{11}H_{24}$	1120-21-4	S
nDodecane	nDodecane	$C_{12}H_{26}$	112-40-3	S
Dodecane	Sum of all dodecane isomers	$C_{12}H_{26}$	N/A	M
aCedrene	alpha-cedrene	$C_{15}H_{24}$	469-61-4	S
aHumulene	alpha-Humulene	$C_{15}H_{24}$	6753-98-6	S
Hydrocarbons: Aromatics and Oxygenated Aromatics				
Benzene	Benzene	C_6H_6	71-43-2	S
Toluene	Toluene	C_7H_8	108-88-3	S
oXylene	o-Xylene	C_8H_{10}	95-47-6	S
mXylene	m-Xylene	C_8H_{10}	108-38-3	S
pXylene	p-Xylene	C_8H_{10}	106-42-3	S
EthBenzene	Ethylbenzene	C_8H_{10}	100-41-4	S
mpXylene	Sum of m-Xylene and p-Xylene	C_8H_{10}	N/A	M
EthBenzAndmpXylene	Sum of Ethylbenzene and mp-Xylene	C_8H_{10}	N/A	M
C8Aromatics	Sum of C8-Aromatics	C_8H_{10}	N/A	M
Styrene	Styrene	C_8H_8	100-42-5	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
Ethynylbenzene	Ethynylbenzene	C_8H_6	536-74-3	S
C9Aromatics	Sum of C9-Aromatics	C_9H_{12}	N/A	M
nPropBenzene	n-Propylbenzene	C_9H_{12}	103-65-1	S
iPropBenzene	Isopropylbenzene	C_9H_{12}	98-82-8	S
x123TrimeBenzene	1,2,3-Trimethylbenzene	C_9H_{12}	526-73-8	S
x124TrimeBenzene	1,2,4-Trimethylbenzene	C_9H_{12}	95-63-6	S
x135TrimeBenzene	1,3,5-Trimethylbenzene	C_9H_{12}	108-67-8	S
x2EthToluene	2-Ethyltoluene	C_9H_{12}	611-14-3	S
x3EthToluene	3-Ethyltoluene	C_9H_{12}	620-14-4	S
x4EthToluene	4-Ethyltoluene	C_9H_{12}	622-96-8	S
pCymene	para-Cymene	$C_{10}H_{14}$	99-87-6	S
C10Aromatics	Sum of C10-Aromatics	$C_{10}H_{14}$	N/A	M
tButBenzene	tert-Butylbenzene	$C_{10}H_{14}$	98-06-6	S
nButBenzene	n-Butylbenzene	$C_{10}H_{14}$	104-51-8	S
mDiethBenzene	1,3-Diethylbenzene	$C_{10}H_{14}$	141-93-5	S
pDiethBenzene	1,4-Diethylbenzene	$C_{10}H_{14}$	105-05-05	S
oDiethBenzene	1,2-Diethylbenzene	$C_{10}H_{14}$	135-01-03	S
C11Aromatics	Sum of C11-Aromatics	$C_{11}H_{16}$	N/A	M
Naphthalene	Naphthalene	$C_{10}H_8$	91-20-3	S
Benzaldehyde	Benzaldehyde	C_7H_6O	100-52-7	S
DHT	Sum of Dihydroxytoluene Isomers	$C_7H_8O_2$	N/A	M
Phenol	Phenol	C_6H_5OH	108-95-2	S
Cresols	Sum of Cresol Isomers (Hydroxytoluenes)	C_7H_8O	N/A	M
Creosol	Creosol	$C_8H_{10}O_2$	93-51-6	S
Oxygenated Inorganic and Volatile Organic Carbon Species				
CO	Carbon monoxide	CO	630-08-0	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
CO2	Carbon dioxide	CO_2	124-38-9	S
x13CO2	13CO2-Carbon dioxide	$^{13}CO_2$	1111-72-4	S
x14CO2	14CO2-Carbon dioxide	$^{14}CO_2$	51-90-1	S
x18OCO	18OCO-Carbon dioxide	^{18}OCO	N/A	S
C3O2	Carbon suboxide	C_3O_2	504-64-3	S
CHOCHO	Glyoxal	$C_2H_2O_2$	107-22-2	S
CH3COCHO	Methyl glyoxal	$C_3H_4O_2$	78-98-8	S
CH3OH	Methanol	CH_4O	67-56-1	S
CH2O	Formaldehyde	CH_2O	50-00-0	S
CH3OOH	Methyl hydroperoxide	CH_4O_2	3031-73-0	S
HMHP	Hydroxymethyl hydroperoxide	CH_4O_3	15932-89-5	S
HCOOH	Formic acid	CH_2O_2	64-18-6	S
C2H5OH	Ethanol	C_2H_6O	64-17-5	S
CH3CHO	Acetaldehyde	C_2H_4O	75-07-0	S
Glycolaldehyde	Glycolaldehyde	$C_2H_4O_2$	141-46-8	S
CH3COOH	Acetic acid	$C_2H_4O_2$	64-19-7	S
CH3COOHAndGlycolaldehyde	Sum of Acetic Acid and Glycolaldehyde	$C_2H_4O_2$	N/A	M
MeFormate	Methyl Formate	$C_2H_4O_2$	107-31-3	S
HAA	Hydroxyacetic acid; Glycolic acid	$C_2H_4O_3$	79-14-1	S
PAA	Peracetic Acid	$C_2H_4O_3$	79-21-0	S
iPropanol	Isopropanol	C_3H_8O	67-63-0	S
Propanal	Propanal	C_3H_6O	123-38-6	S
Acetone	Acetone	C_3H_6O	67-64-1	S
AcetoneAndPropanal	Sum of Acetone and Propanal	C_3H_6O	N/A	M
Acrolein	Acrolein	C_3H_4O	107-02-08	S
C3H6O2	Sum of C3H6O2 Isomers, including Hydroxyacetone	$C_3H_6O_2$	N/A	M

CoreName	Definition	Chemical Formula	CAS Number	Specificity
EthFormate	Ethyl Formate	$C_3H_6O_2$	109-94-4	S
MeAcetate	Methyl acetate	$C_3H_6O_2$	79-20-9	S
C2H5COOH	Propanoic acid	$C_3H_6O_2$	79-09-4	S
C3H6O3	Sum of C3H6O3 Isomers, including Hydroperoxy Acetone	$C_3H_6O_3$	N/A	M
Butanal	Butanal	C_4H_8O	123-72-8	S
iButanal	Isobutanal	C_4H_8O	78-84-2	S
MEK	Methyl Ethyl Ketone	C_4H_8O	78-93-3	S
THF	Tetrahydrofuran	C_4H_8O	109-99-9	S
ButanalAndMEK	Sum of Butanal and MEK	C_4H_8O	N/A	M
C4Carbonyls	Sum of C4-Carbonyls	C_4H_8O	N/A	M
EthAcetate	Ethyl acetate	$C_4H_8O_2$	141-78-6	S
MePropionate	Methyl propionate	$C_4H_8O_2$	554-12-1	S
x14Dioxane	1,4-Dioxane	$C_4H_8O_2$	123-91-1	S
C4H8O3	Sum of C4H8O3 Isomers, including C4 Dihydroxy Carbonyls	$C_4H_8O_3$	N/A	M
MAC	Methacrolein	C_4H_6O	78-85-3	S
MVK	Methyl Vinyl Ketone	C_4H_6O	78-94-4	S
MVKAndMAC	Sum of MVK and Methacrolein	C_4H_6O	N/A	M
E2Butenal	(E)-2-Butenal, trans-Crotonaldehyde	C_4H_6O	123-73-9	S
Z2Butenal	(Z)-2-Butenal, cis-Crotonaldehyde	C_4H_6O	15798-64-8	S
x2Butenals	Sum of (Z)- and (E)-2-Butenal isomers, Crotonaldehyde	C_4H_6O	4170-30-3	M
x23Butanedione	2,3-Butanedione	$C_4H_6O_2$	431-03-8	S
C4H6O3	Sum of C4H6O3 Isomers, including C4 Hydroxy Dicarbonyls	$C_4H_6O_3$	N/A	M
Furan	Furan	C_4H_4O	110-00-9	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
x2Furanone	2-Furanone, including 2(5H)Furanone and 2(3H)Furanone	$C_4H_4O_2$	N/A	M
x23HFuranone	2(3H)-Furanone	$C_4H_4O_2$	20825-71-2	S
x25HFuranone	2(5H)-Furanone	$C_4H_4O_2$	497-23-4	S
SuccinicAnhyd	Succinic anhydride	$C_4H_4O_3$	108-30-5	S
C4H4O3	Sum of C4H4O3 Isomers	$C_4H_4O_3$	N/A	M
MaleicAnhyd	Maleic anhydride	$C_4H_2O_3$	108-31-6	S
MTBE	Methyl Tert-Butyl Ether	$C_5H_{12}O$	1634-04-04	S
MBO	2-Methyl-3-buten-2-ol	$C_5H_{10}O$	115-18-4	S
Pentanal	Pentanal	$C_5H_{10}O$	110-62-3	S
x2Pentanone	2-Pentanone	$C_5H_{10}O$	107-87-9	S
x3Pentanone	3-Pentanone	$C_5H_{10}O$	96-22-0	S
C5Carbonyls	Sum of C5-Carbonyls	$C_5H_{10}O$	N/A	M
ISOPOOHAndIEPOX	Sum of ISOPOOH and IEPOX	$C_5H_{10}O_3$	N/A	M
IEPOX	Sum of Isoprene Epoxy Diol Isomers	$C_5H_{10}O_3$	N/A	M
ISOPOOH	Sum of Isoprene Hydroxy Hydroperoxide Isomers	$C_5H_{10}O_3$	N/A	M
C5H8O3	Sum of C5O3H8 Compounds, including HPALDs Isomers	$C_5H_8O_3$	N/A	M
x2MeFuran	2-Methylfuran	C_5H_6O	534-22-5	S
x3MeFuran	3-Methylfuran	C_5H_6O	930-27-8	S
x2MeFuranAnd3MeFuran	Sum of 2-methylfuran 3-methylfuran and fragments	C_5H_6O	N/A	M
Furfural	Furfural	$C_5H_4O_2$	98-01-1	S
x3Furaldehyde	3-Furaldehyde	$C_5H_4O_2$	498-60-2	S
HPALDs	Sum of HPALDs	$C_5H_8O_3$	N/A	M
Hexanal	Hexanal	$C_6H_{12}O$	66-25-1	S
x2Hexanone	2-Hexanone	$C_6H_{12}O$	591-78-6	S
x3Hexanone	3-Hexanone	$C_6H_{12}O$	589-38-8	S

CoreName	Definition	Chemical Formula	CAS Number	Specificity
C6Carbonyls	Sum of C6-Carbonyls	$C_6H_{12}O$	N/A	M
CycHexanone	Cyclohexanone	$C_6H_{10}O$	108-94-1	S
C6H10O5	Sum of Levoglucosan and other C6H10O5 species	$C_6H_{10}O_5$	N/A	M
DimeFurans	Sum of Dimethylfurans	C_6H_8O	N/A	M
x25DimeFuran	2,5-Dimethylfuran	C_6H_8O	625-86-5	S
x24DimeFuran	2,4-Dimethylfuran	C_6H_8O	3710-43-8	S
x23DimeFuran	2,3-Dimethylfuran	C_6H_8O	14920-89-9	S
x2EthFuran	2-Ethylfuran	C_6H_8O	3208-16-0	S
x3EthFuran	3-Ethylfuran	C_6H_8O	67363-95-5	S
Phenol	Phenol	C_6H_6O	108-95-2	S
x2EthenylFuran	2-Ethenylfuran	C_6H_6O	1487-18-9	S
x3EthenylFuran	3-Ethenylfuran	C_6H_6O	67364-02-7	S
C6H6O	Sum of Phenol and other C6H6O species	C_6H_6O	N/A	M
x5MeFurfural	5-methylfurfural	$C_6H_6O_2$	620-02-0	S
Catechol	Catechol	$C_6H_6O_2$	120-80-9	S
C6H6O2	Sum of Catechol and other C6H6O2 species	$C_6H_6O_2$	N/A	M
C6H4O3	Hydroxybenzoquinone – including any compounds that can be viewed as derivatives of a benzoquinone	$C_6H_4O_3$	N/A	M
Anisole	Anisole	C_7H_8O	100-66-3	S
C7H8O	Sum of C7H8O Isomers	C_7H_8O	N/A	M
Guaiacol	Guaiacol	$C_7H_8O_2$	90-05-1	S
BenzFuran	Benzofuran	C_8H_6O	271-89-6	S
Syringol	Syringol	$C_8H_{10}O_3$	91-10-1	S
C9H14O4	Sum of Pinic Acid and other C9H14O4 species	$C_9H_{14}O_4$	N/A	M

CoreName	Definition	Chemical Formula	CAS Number	Specificity
C10H16O3	Sum of Pinonic Acid and other C10H16O3 species	$C_{10}H_{16}O_3$	N/A	M
Linalool	Linalool	$C_{10}H_{18}O$	78-70-6	S
Terpineol	Terpineol	$C_{10}H_{18}O$	8006-39-1	S
aTerpineol	alpha-Terpineol	$C_{10}H_{18}O$	98-55-5	S
Geraniol	Geraniol	$C_{10}H_{18}O$	N/A	M
tGeraniol	trans-Geraniol	$C_{10}H_{18}O$	106-24-1	S
cGeraniol	cis-Geraniol	$C_{10}H_{18}O$	106-25-2	S
SabineneHydrate	Sabinene hydrate	$C_{10}H_{18}O$	546-79-2	S
Borneol	Borneol	$C_{10}H_{18}O$	N/A	M
Pulegone	Pulegone	$C_{10}H_{16}O$	89-82-7	S
LFenchone	L-Fenchone	$C_{10}H_{16}O$	7787-20-4	S
Fenchol	Fenchol	$C_{10}H_{16}O$	2217-02-09	S
Camphor	Camphor	$C_{10}H_{16}O$	N/A	M
Guaiol	Guaiol	$C_{15}H_{26}O$	489-86-1	S
tNeroidol	trans-Neroidol	$C_{15}H_{26}O$	40716-66-3	S

2.2 Aerosol Particle Standard Names

The MeasurementCategory for aerosol particles is either “AerMP”, “AerComp”, or “AerOpt” for aerosol particle microphysical properties, aerosol particle composition, and aerosol particle optical properties, respectively. AerMP has four DescriptiveAttributes: MeasurementRH, SizingTechnique, SizeRange, and Reporting; AerComp has three DescriptiveAttributes: SizingTechnique, SizeRange, and Reporting; and AerOpt has four DescriptiveAttributes: MeasurementRH, WL, SizeRange, and Reporting. The CoreNames for aerosol variables are listed in Table 10.

For aerosol particle microphysical and optical measurements, relative humidity (RH) conditions are important because water vapor can condense onto the particle and change its size and optical properties. In-situ aerosol particle measurements can be made or calculated at different RH levels. Table 5 defines the three possible modes of aerosol particle measurements related to relative humidity levels (MeasurementRH): RHd, RHa, and RHsp. If “RHsp” is used, the relative humidity at which the measurement is reported must be documented in the variable description.

Table 5: List of Possible Aerosol Particle Measurement RH values

MeasurementRH	Description
RHd	Variable reported at a reduced relative humidity, typically less than 40%
RHa	Variable reported at ambient relative humidity
RHsp	Variable reported at a specified relative humidity
None	Not applicable to variable

SizingTechnique is an important descriptive attribute because the measurement of the size of a single particle can vary when using different techniques (based on the properties of the particle, such as its composition, shape and density). Each technique has inherent assumptions, limitations, and operable ranges that are vital for proper interpretation and comparison of the data. Table 6 defines the values of "SizingTechnique" representing the different measurement techniques for particle size determination. If the SizingTechnique is "None", the SizeRange used must be "Total", which is typically for bulk measurements.

Table 6: List of Aerosol Particle SizingTechniques

SizingTechnique	Description
Mobility	The electrical mobility diameter is the diameter of a sphere with the same migration velocity in a constant electric field as the particle of interest (i.e., migration velocity in a constant electric field; DeCarlo et al., 2004).
Optical	Size measurement made using the intensity of light scattered by a particle, related to particle size using a prescribed refractive index and assumed spherical shape.
Aerodynamic	The aerodynamic diameter is defined as the diameter of a sphere with standard density that settles at the same terminal velocity as the particle of interest (DeCarlo et al., 2004).
VacuumAerodynamic	The vacuum aerodynamic diameter is measured in a free-molecular flow regime (that is, in conditions where the ratio of the mean free path of the gas molecules to the size of the particle >> 1) ; DeCarlo et al., 2004).
LII	LII (Laser-induced incandescence) size is the refractory black carbon size derived from mass measurement and assumptions of void free density (1.8 g/cc) and spherical shape. Refractory black carbon mass is determined from incandescent light intensity at vaporization temperature.
Imaging	Measurement of a particle's size using an image.

Geometric	Geometric size derived from direct measurement(s)
Kelvin	Kelvin size refers to the smallest size at which condensation occurs at a particular supersaturation, as the saturation vapor pressure is dependent on the particle radius of curvature. Kelvin size is determined by varying the supersaturation of a vapor and counting the number droplets that activate.
None	No specific size determination – Bulk measurement

The "SizeRange" delineates the range of particle sizes being measured. There are seven possible SizeRanges that can be used: Nucl, Accu, Coarse, Bulk, PM1, PMx, and XtoY, where X and Y can be Nucl, Accu, or Coarse, e.g., NucltoAccu (Table 7). When "Bulk" is used, SizingTechnique must be "None".

Table 7: Summary of Aerosol Particle Size Ranges

SizeRange	**Description**
Nucl	Nucleation-mode aerosol particles: 0.001-0.1 um diameter
Accu	Accumulation-mode aerosol particles: 0.1-1 um diameter
Coarse	Coarse-mode aerosol particles: greater than 1 um diameter
Bulk	Measurement not size resolved
PM1	Submicron aerosol particles: less than 1 um diameter
PMx	Particles with diameter under X um diameter, e.g., PM2.5
XtoY	Size Range from X to Y, e.g., NucltoAccu

Aerosol particle optical properties are functions of wavelengths (WL) of light. Therefore, a measurement of aerosol particle optical properties is made at one or more specific wavelength(s). Table 8 lists the values for "WL" attributes, specifying the wavelength ranges within which instruments commonly operate.

Table 8: List of Wavelength Ranges for Aerosol Particle Optical Property Measurements

WL	**Description**
UV	Ultraviolet: 10- 400 nm
Blue	450 – 495 nm
Green	495 – 570 nm

Red	620 – 700 nm
IR	Infrared: 700 – 10^6 nm
XtoY	Wavelength range from X to Y E.g., BluetoRed

Lastly, aerosol particle standard names have a DescriptiveAttribute to indicate the reporting method used. Aerosol particle chemical compositions can be reported as mass concentrations at either STP or ambient temperature and pressure, mass fractions, or number fractions. Similarly, aerosol particle microphysical and optical properties can also be reported at either STP or ambient conditions. For variables that are dimensionless (e.g., fRH, SSA) the reporting attribute is "None". See Table 9 for an explanation of each of these options. When reporting in standard temperature and pressure (STP), the temperature and pressure conditions under which the measurement is reported must be noted in the header or metadata of the data file, as "standard temperature" varies across the research community. Similarly, if the reporting attribute is "EnvSp", the specific environment temperature and pressure must be referenced in the header or variable description.

Table 9: Reporting Attribute Values for Aerosol Particle Measurements

Reporting	**Description**
MassSTP	Mass concentration reported at standard temperature and pressure
MassAMB	Mass concentration reported at ambient temperature and pressure
MassFrac	Mass Fraction - Ratio of a constituent mass to the total aerosol particle mass concentration
NumFrac	Number Fraction - Ratio of a constituent number to the total aerosol particle number concentration
NumConcSTP	Number concentration of particle constituent at standard temperature and pressure
NumConcAMB	Number concentration of particle constituent at ambient temperature and pressure
STP	Aerosol particle properties reported at standard temperature and pressure
AMB	Aerosol particle properties reported at ambient temperature and pressure
None	For dimensionless variables

Reporting	Description
EnvSp	Aerosol particle properties reported in a specific environment (e.g., mobile vehicle) with specified temperature and pressure

The following examples provide the controlled vocabulary options for AcquisitionMethod as well as the DescriptiveAttributes that apply to each aerosol particle classification category.

Aerosol Particle Microphysical Properties:
AerMP_CoreName_AcquisitionMethod_MeasurementRH_SizingTechnique_SizeRange_Reporting
AcquisitionMethod = InSitu, VertCol, SlantCol, Profile
MeasurementRH = RHd, RHa, RHsp, None
SizingTechnique = Mobility, Optical, Aerodynamic, VacuumAerodynamic, LII, Imaging, Geometric, Kelvin, None
SizeRange = Nucl, Accu, Coarse, Bulk, PM1, PMx, XtoY
Reporting = STP, AMB, None, EnvSp

Example of an in-situ measurement of aerosol particle number size distribution reported at reduced relative humidity derived from an aerodynamic sizing technique for coarse-mode aerosols at standard temperature and pressure:
AerMP_NumSizeDist_InSitu_RHd_Aerodynamic_Coarse_STP

Aerosol Particle Chemical Composition:
AerComp_CoreName_AcquisitionMethod_SizingTechnique_SizeRange_Reporting
AcquisitionMethod = InSitu, VertCol, SlantCol, Profile
SizingTechnique = Mobility, Optical, Aerodynamic, VacuumAerodynamic, LII, Imaging, Geometric, Kelvin, None
SizeRange = Nucl, Accu, Coarse, Bulk, PM1, PMx, XtoY
Reporting = MassSTP, MassAMB, MassFrac, NumFrac, NumConcSTP, NumConcAMB

Example of an in-situ measurement of organic aerosols particles derived using a vacuum aerodynamic technique for accumulation-mode aerosol particles reported as mass concentration at standard temperature and pressure:
AerComp_OrganicAerosol_InSitu_VacuumAerodynamic_Accu_MassSTP

Example of an in-situ measurement of bulk sea salt particles reported in number fraction:
AerComp_Seasalt_InSitu_None_Bulk_NumFrac

Aerosol Particle Optical Properties:
AerOpt_CoreName_AcquisitionMethod_WL_MeasurementRH_SizeRange_Reporting
AcquisitionMethod = InSitu, VertCol, SlantCol, Profile
WL = UV, Blue, Green, Red, IR, XtoY
MeasurementRH = RHd, RHa, RHsp, None
SizeRange = Nucl, Accu, Coarse, Bulk, PM1, PMx, XtoY
Reporting = STP, AMB, None, EnvSp

Example of an in-situ measurement of absorption measured at a red wavelength under reduced humidity conditions with a bulk aerosol particle size range reported in ambient conditions: AerOpt_Absorption_InSitu_red_RHd_Bulk_AMB

Table 10: List of Aerosol Particle Measurement CoreNames

Measurement Category	**CoreName**	**Definition**
AerMP	NumConc	Number Concentration of Aerosol Particles
AerMP	NonVolatileNumConc	Non-Volatile Number Concentration of Aerosol Particles
AerMP	SurfAreaConc	Surface Area Concentration of Aerosol Particles
AerMP	NonVolatileSurfAreaConc	Non-Volatile Surface Area Concentration of Aerosol Particles
AerMP	VolConc	Volume Concentration of Aerosol Particles
AerMP	NonVolatileVolConc	Non-Volatile Volume Concentration of Aerosol Particles
AerMP	CCN	Cloud Condensation Nuclei Concentration
AerMP	CCNtoCNRatio	Cloud Condensation Nuclei to Condensation Nuclei Ratio
AerMP	INP	Ice Nucleating Particles
AerMP	gRH	Aerosol Particle Size Growth Factor
AerMP	MassSizeDist	Mass Concentration Size Distribution of Aerosol Particles
AerMP	MassConc	Mass Concentration of Aerosol Particles
AerMP	NonVolatileMassSizeDist	Non-Volatile Mass Concentration Size Distribution of Aerosol Particles
AerMP	NumSizeDist	Number Concentration Size Distribution of Aerosol Particles
AerMP	NonVolatileNumSizeDist	Non-Volatile Number Size Distribution of Aerosol Particles
AerMP	SurfAreaSizeDist	Surface Area Concentration Size Distribution of Aerosol Particles
AerMP	NonVolatileSurfAreaSizeDist	Non-Volatile Surface Area Concentration Size Distribution
AerMP	VolSizeDist	Volume Concentration Size Distribution of Aerosol Particles

Measurement Category	CoreName	Definition
AerMP	NonVolatileVolSizeDist	Non-Volatile Volume Concentration Size Distribution of Aerosol Particles
AerMP	EffSize	Aerosol Particle Effective Size – Surface Area Weighted Average Size
AerMP	EffVar	Aerosol Particle Effective Variance – Width of Aerosol Size Distribution
AerMP	MeanSize	Aerosol Particle Mean Size (Radius or Diameter)
AerMP	MedianSize	Aerosol Particle Median Size (Radius or Diameter)
AerMP	MeanVolumeSize	Aerosol Particle Mean Size (Radius or Diameter) weighted by Volume
AerMP	MedianVolumeSize	Aerosol Particle Median Size (Radius or Diameter) weighted by Volume
AerMP	BCFracIM	Black Carbon Faction of Internally Mixed
AerMP	BCCoatThick	Black Carbon Coating Thickness
AerComp	Acidity	Aerosol Particle Acidity
AerComp	BC	Particulate Black Carbon
AerComp	BCMassSizeDist	Particulate Black Carbon Mass Size Distribution
AerComp	BCNumSizeDist	Particulate Black Carbon Number Size Distribution
AerComp	Bromide	Particulate Bromide Ion
AerComp	Calcium	Particulate Calcium Ion
AerComp	Chloride	Particulate Chloride Ion
AerComp	Potassium	Particulate Potassium Ion
AerComp	Magnesium	Particulate Magnesium Ion
AerComp	Iodide	Particulate Iodide Ion, including iodide, iodate, and organic-bound iodine
AerComp	Sodium	Particulate Sodium Ion
AerComp	Nitrite	Particulate Nitrite Ion
AerComp	Nitrate	Particulate Nitrate Ion
AerComp	OrganicAerosol	Particulate organic matter,

Measurement Category	CoreName	Definition
		including carbon and all other elements (e.g. H, O, N) in organic molecules
AerComp	OrganicCarbon	Carbon contained in particulate organic matter, not including the mass of other elements in the organic molecules (e.g. H, O, N)
AerComp	HtoORatio	Hydrogen to Oxygen Ratio in Organic particulate matter
AerComp	Oxalate	Particulate Oxalate Ion
AerComp	Sulfate	Particulate Sulfate Ion
AerComp	TotalMass	Total Particulate Mass
AerComp	WSOC	Particulate Water Soluble Organic Carbon, a subset of OrganicAerosol and OrganicCarbon, including only the mass of carbon (and not H, O, N) in the water-soluble molecules
AerComp	Ammonium	Particulate Ammonium Ion
AerComp	Acid	Particulate Aerosol Acid
AerComp	NegativeIon	Total Particulate Negative Ions
AerComp	PositiveIon	Total Particulate Positive Ions
AerComp	BBParticles	Biomass Burning Particles
AerComp	Mineral	Mineral Particles
AerComp	Seasalt	Sea Salt Particles
AerComp	Soot	Soot Particles
AerComp	Beryllium7	Particulate Beryllium7
AerComp	Lead210	Particulate Lead210
AerComp	MSA	Particulate Methanesulfonic Acid Mass
AerComp	ClO4	Particulate Perchlorate Mass
AerComp	AmmBalance	Molar ratio of Ammonium to other inorganic ions in Particulate Matter
AerComp	Density	Particulate Matter Density
AerComp	OADensity	Particulate Organic Matter Density

Measurement Category	CoreName	Definition
AerComp	OAtoOC	Ratio of Organic Particulate Matter to Organic Carbon (OC)
AerComp	OSc	Particulate Carbon Oxidation State
AerComp	OrgNitrFraction	Particulate Fraction of nitrate coming from organic nitrates
AerComp	BioAerosol	Particulate Biological Aerosol
AerOpt	Absorption	Aerosol Particle Absorption Coefficient
AerOpt	AbsorptionBrC	Aerosol particle measurement of light absorbance by particulate organic carbon
AerOpt	AbsorptionBrCLiquid	Liquid based measurement of light absorbance by particulate organic carbon
AerOpt	Scattering	Aerosol Particle Scattering Coefficient
AerOpt	BackScattering	Aerosol Particle Backscattering Coefficient
AerOpt	Extinction	Aerosol Particle Extinction Coefficient
AerOpt	KExinction	Aerosol Particle Extinction Cross Section
AerOpt	LidarRatio	Ratio of Aerosol Extinction Coefficient to Backscattering Coefficient of Aerosol Particles
AerOpt	AerosolType	Classification of Aerosol Particles Determined from Optical Properties
AerOpt	AngstromExponentAbs	Aerosol Particle Angstrom Exponent for Absorption Coefficients
AerOpt	AngstromExponentScat	Aerosol Particle Angstrom Exponent for Scattering Coefficients
AerOpt	AngstromExponentBackScat	Aerosol Particle Angstrom Exponent for Backscattering Coefficients
AerOpt	AngstromExponentExt	Aerosol Particle Angstrom Exponent for Extinction Coefficients
AerOpt	AngstromExponentAOD	Aerosol Particle Angstrom Exponent for Aerosol Optical Depth
AerOpt	DepolarizationRatio	Aerosol Particle Depolarization Ratio
AerOpt	TotalDepolarizationRatio	Aerosol Particle and Molecular Depolarization Ratio
AerOpt	SSA	Single Scattering Albedo

Measurement Category	CoreName	Definition
AerOpt	AsymmetryParameterScat	Aerosol Particle Scattering Asymmetry Parameter
AerOpt	fRHScat	Aerosol Particle Scattering Hygroscopicity Factor
AerOpt	fRHBC	Particulate Black Carbon Specific Scattering Hygroscopicity Factor
AerOpt	Gamma	Aerosol Particle Scattering Hygroscopicity Gamma Factor
AerOpt	PhaseFunctionExt	Aerosol Particle Extinction Phase Function
AerOpt	PhaseFunctionScat	Aerosol Particle Scattering Phase Function
AerOpt	PolarPhaseFunctionScat	Aerosol Particle Scattering Polarized Phase Function
AerOpt	m	Real Component of Particulate Refractive Index
AerOpt	k	Imaginary Component of Particulate Refractive Index
AerOpt	n	Particulate Complex Refractive Index
AerOpt	AOD	Column-Integrated Extinction Aerosol Optical Depth
AerOpt	AAOD	Column-Integrated Absorption Aerosol Optical Depth

2.3 Cloud Standard Names

Similar to aerosol particle variables, the MeasurementCategory for measurements of cloud properties are “CldOpt” for optical properties, “CldComp” for chemical composition, “CldMicro” for microphysical properties, and “CldMacro” for macrophysical properties. CoreNames for the variables in each of these categories are given in Table 15. The DescriptiveAttributes for CldMicro and CldComp are SizingTechnique, SizeRange, and Reporting. For CldOpt, the DescriptiveAttribute is WL for wavelength of light. There are no DescriptiveAttributes associated with CldMacro (i.e., DescriptiveAttributes = None).

SizingTechnique is an important property because a single cloud particle can have a different size based on the particle’s composition and shape, depending on which technique is used. Each technique has inherent assumptions, limitations, and operable ranges that are vital for proper interpretation and comparison of the data. The cloud particle size can be determined by one of two different techniques: Imaging or Optical. If there is no specific size determination (e.g., bulk measurements), the SizingTechnique is “None”. In this case, the SizeRange must be “Bulk”. See Table 11 for a description of these techniques.

Table 11: Summary of Cloud Particle Sizing Techniques

SizingTechnique	**Description**
Imaging	Measurement of a particle's size using an image.
Optical	Size derived from the intensity of light scattered by a particle, related to particle size using a prescribed refractive index of 1.33 (for water).
None	No specific size determination – Bulk measurement

Another DescriptiveAttribute associated with CldMicro and CldComp variables is SizeRange. SizeRange delineates the range of measured particle sizes, which can be categorized as either droplets ("Drop"), precipitation ("Precip"), or "Bulk". When "Bulk" is used, the accompanying SizingTechnique must be "None". Table 12 specifies the SizeRange for each of these ranges.

Table 12: Specification of Cloud Particle Size Ranges

SizeRange	**Description**
Drop	Droplets: Particle size range: 2-50 um diameter
Precip	Precipitation: Particle size range: greater than 50 um diameter
Bulk	Measurement not size resolved
XtoY	Size Range from X to Y, e.g., DroptoPrecip

Cloud optical properties are functions of wavelengths of light. Therefore, a measurement of cloud optical properties is made at a specific wavelength. Table 13 lists the WL DescriptiveAttributes specifying the wavelength ranges within which instruments commonly operate.

Table 13: List Wavelength Ranges for Cloud Optical Property Measurements

WL Attributes	**Description**
UV	Ultraviolet: 10- 400 nm
Blue	440 - 490 nm
Green	490 - 570 nm
Red	620 - 700 nm
IR	Infrared: 700 - 10^6 nm

WL Attributes	Description
XtoY	Ratio of a measurement at X wavelength to the same measurement at Y wavelength. E.g., fromBluetoRed

Table 14: Reporting Attribute Values for Cloud Measurements

Reporting	Description
MassSTP	Mass concentration reported at standard temperature and pressure
MassAMB	Mass concentration reported at ambient temperature and pressure
MassFrac	Mass Fraction - Ratio of a constituent mass to the total aerosol cloud mass concentration
NumFrac	Number Fraction - Ratio of a constituent number to the total particle number concentration
NumConc	Number concentration of particle constituent
STP	Cloud properties reported at standard temperature and pressure
AMB	Cloud properties reported at ambient temperature and pressure
None	For dimensionless variables

Cloud Variables for Microphysical Properties:
CldMicro_CoreName_AcquisitionMethod_SizingTechnique_SizeRange_Reporting
AcquisitionMethod = InSitu, VertCol, SlantCol, Profile
SizingTechnique = Imaging, Optical, None
SizeRange = Drop, Precip, Bulk, XtoY
Reporting = STP, AMB, None

Example of an in-situ measurement of cloud particle number size distribution derived from an optical sizing technique measuring droplets being reported at ambient conditions:
CldMicro_NumSizeDist_InSitu_Optical_Drop_AMB

Cloud Variables for Chemical Composition:
CldComp_CoreName_AcquisitionMethod_SizingTechnique_SizeRange_Reporting
AcquisitionMethod = InSitu, VertCol, SlantCol, Profile
SizingTechnique = Imaging, Optical, None
SizeRange = Drop, Precip, Bulk, XtoY
Reporting = MassSTP, MassAMB, MassFrac, NumFrac, NumConc

Example of an in-situ measurement of the mass concentration of sodium derived from a chemical technique where the particle measurement is not size resolved reported at ambient conditions: CldComp_Sodium_InSitu_None_Bulk_MassAMB

Cloud Variables for Optical Properties:
CldOpt_CoreName_AcquisitionMethod_WL
AcquisitionMethod = InSitu, VertCol, SlantCol, Profile
WL = UV, Blue, Green, Red, IR, or XtoY

Example of an in-situ measurement of cloud particle extinction coefficient measured in the blue wavelength: CldOpt_Extinction_InSitu_blue

Cloud Variables for Macrophysical Properties:
CldMacro_CoreName_AcquisitionMethod_None
AcquisitionMethod = InSitu, VertCol, SlantCol, Profile

Example of an in-situ measurement of cloud top height: CldMacro_CTH_InSitu_None

Table 15: List of CoreNames for Cloud Property Measurements

Measurement Category	**CoreName**	**Definition**
CldMicro	CrossSectionalArea SizeDist	Cloud Particle Cross Section Area Concentration Size Distribution
CldMicro	MassSizeDist	Cloud Particle Mass Concentration Size Distribution
CldMicro	NumSizeDist	Cloud Particle Number Concentration Size Distribution
CldMicro	NumConc	Cloud Particle Number Concentration
CldMicro	SurfAreaConc	Cloud Particle Surface Area Concentration
CldMicro	VolConc	Cloud Particle Volume Concentration
CldMicro	SurfAreaSizeDist	Cloud Particle Surface Area Concentration Size Distribution
CldMicro	VolSizeDist	Cloud Particle Volume Concentration Size Distribution
CldMicro	MeanSize	Cloud Particle Mean Size (Radius or Diameter)
CldMicro	MedianSize	Cloud Particle Median Size (Radius or Diameter)
CldMicro	MeanVolumeSize	Cloud Particle Mean Size (Radius or Diameter) weighted by Volume
CldMicro	MedianVolumeSize	Cloud Particle Median Size (Radius or Diameter) weighted by Volume
CldMicro	EffSize	Cloud Particle Effective Radius or Diameter

Measurement Category	CoreName	Definition
CldMicro	EffVar	Cloud Particle Effective Variance
CldMicro	LWC	Cloud Particle Liquid Water Content
CldMicro	IWC	Cloud Particle Ice Water Content
CldMicro	TWC	Cloud Particle Total Water content
CldMacro	LWP	Liquid Water Path – Column Integrated Liquid Water Content
CldMacro	CTH	Cloud Top Height
CldMacro	CBH	Cloud Bottom Height
CldOpt	Extinction	Cloud Particle Extinction Coefficient
CldOpt	OD	Cloud Optical Depth
CldComp	INP	Ice Nucleating Particles
CldComp	Sodium	Cloud Water Mass Concentration of Sodium
CldComp	Chloride	Cloud Water Mass Concentration of Chloride
CldComp	Calcium	Cloud Water Mass Concentration of Calcium
CldComp	Ammonium	Cloud Water Mass Concentration of Ammonium
CldComp	Potassium	Cloud Water Mass Concentration of Potassium
CldComp	Magnesium	Cloud Water Mass Concentration of Magnesium
CldComp	Sulfate	Cloud Water Mass Concentration of Sulfate
CldComp	Nitrate	Cloud Water Mass Concentration of Nitrate
CldComp	Oxalate	Cloud Water Mass Concentration of Oxalate
CldComp	Lithium	Cloud Water Mass Concentration of Lithium
CldComp	Beryllium	Cloud Water Mass Concentration of Beryllium
CldComp	Boron	Cloud Water Mass Concentration of Boron
CldComp	Aluminium	Cloud Water Mass Concentration of Aluminium
CldComp	Silicon	Cloud Water Mass Concentration of Silicon
CldComp	Phosphorus	Cloud Water Mass Concentration of Phosphorus
CldComp	Sulfur	Cloud Water Mass Concentration of Sulfur
CldComp	Titanium	Cloud Water Mass Concentration of Titanium

Measurement Category	CoreName	Definition
CldComp	Vanadium	Cloud Water Mass Concentration of Vanadium
CldComp	Chromium	Cloud Water Mass Concentration of Chromium
CldComp	Manganese	Cloud Water Mass Concentration of Manganese
CldComp	Iron	Cloud Water Mass Concentration of Iron
CldComp	Cobalt	Cloud Water Mass Concentration of Cobalt
CldComp	Nickel	Cloud Water Mass Concentration of Nickel
CldComp	Copper	Cloud Water Mass Concentration of Copper
CldComp	Zinc	Cloud Water Mass Concentration of Zinc
CldComp	Arsenic	Cloud Water Mass Concentration of Arsenic
CldComp	Selenium	Cloud Water Mass Concentration of Selenium
CldComp	Rubidium	Cloud Water Mass Concentration of Rubidium
CldComp	Strontium	Cloud Water Mass Concentration of Strontium
CldComp	Yttrium	Cloud Water Mass Concentration of Yttrium
CldComp	Zirconium	Cloud Water Mass Concentration of Zirconium
CldComp	Niobium	Cloud Water Mass Concentration of Niobium
CldComp	Molybdenum	Cloud Water Mass Concentration of Molybdenum
CldComp	Ruthenium	Cloud Water Mass Concentration of Ruthenium
CldComp	Palladium	Cloud Water Mass Concentration of Palladium
CldComp	Silver	Cloud Water Mass Concentration of Silver
CldComp	Cadmium	Cloud Water Mass Concentration of Cadmium
CldComp	Tin	Cloud Water Mass Concentration of Tin
CldComp	Tellurium	Cloud Water Mass Concentration of Tellurium
CldComp	Caesium	Cloud Water Mass Concentration of Caesium
CldComp	Barium	Cloud Water Mass Concentration of Barium
CldComp	Hafnium	Cloud Water Mass Concentration of Hafnium
CldComp	Tantalum	Cloud Water Mass Concentration of Tantalum
CldComp	Osmium	Cloud Water Mass Concentration of Osmium
CldComp	Platinum	Cloud Water Mass Concentration of Platinum

Measurement Category	CoreName	Definition
CldComp	Gold	Cloud Water Mass Concentration of Gold
CldComp	Mercury	Cloud Water Mass Concentration of Mercury
CldComp	Thallium	Cloud Water Mass Concentration of Thallium
CldComp	Lead	Cloud Water Mass Concentration of Lead
CldComp	WSOC	Cloud Water Mass Concentration of Water Soluble Organic Carbon

2.4 Meteorology Standard Names

The "MeasurementCategory" for meteorology parameters is Met. CoreNames for meteorology variables are listed in Table 16. There are no DescriptiveAttributes associated with meteorology variables (i.e., DescriptiveAttributes = None).

Meteorology Parameters:
Met_CoreName_AcquisitionMethod_None
AcquisitionMethod = InSitu, VertCol, SlantCol, Profile

Example of an in-situ measurement of static temperature: Met_StaticTemperature_InSitu_None

Table 16: List of CoreNames for Meteorological Measurements

CoreName	Definition
StaticPressure	Ambient Atmospheric Pressure
StaticAirTemperature	Ambient air temperature
PotentialTemperature	Potential temperature
DewPoint	Temperature to which air must be cooled to become saturated with respect to liquid water (or frost)
PartialPressureH2O	Partial pressure of water vapor in air
H2OMRV	Volumetric water vapor mixing ratio
H2OMR	Mass mixing ratio of water vapor to dry air mass
H2OdD	Deviations in the D/H Stable Hydrogen Isotope Ratio relative to H_2O vapor
H2Od18O	Deviations in the $^{18}O/^{16}O$ Stable Oxygen Isotope Ratio relative to H_2O vapor
H2OTotalDMR	Mass mixing ratio of total water (vapor + liquid + ice) over dry air

CoreName	Definition
VWP	Vapor Water Path – column integrated water vapor content
SpecificHumidity	Ratio of the mass of water vapor to the total mass of air (ambient air)
VaporDensity	Absolute Humidity: Ratio of the mass of water vapor present to the volume occupied by ambient air
RelativeHumidityIce	Relative Humidity over Ice
RelativeHumidityWater	Relative Humidity over Water
SatVaporPressureH2OIce	Saturation Vapor Pressure over Ice – Equilibrium saturation water vapor pressure with respect to water ice
SatVaporPressureH2OWater	Saturation Vapor Pressure over liquid Water – Equilibrium saturation water vapor pressure with respect to liquid water
SurfaceTemperature	Temperature of large-area of subjects, e.g., Sea or other large water surface, cloud, or terrain
UWindSpeed	E-W Horizontal Wind Speed
VWindSpeed	N-S Horizontal Wind Speed
WWindSpeed	Vertical Wind Speed
UstdWindSpeed	Standard deviation of E-W Horizontal Wind Speed
VstdWindSpeed	Standard deviation of N-S Horizontal Wind Speed
WstdWindSpeed	Standard deviation of Vertical Wind Speed
UWindVariance	Variance of the E-W Horizontal Wind Speed
VWindVariance	Variance of the N-S Horizontal Wind Speed
WWindVariance	Variance of the vertical Wind Speed
WindSpeed	Scalar Wind Speed
WindDirection	Wind Direction, positive North
SolarAzimuthAngle	Solar Azimuth Angle
SolarZenithAngle	Solar Zenith Angle
Ustar	Friction Velocity
Wstar	Convective Velocity Scale
TKE	Turbulent Kinetic Energy

CoreName	Definition
TEDR	Turbulent Dissipation Rate
REYN	Reynolds Number
LatentHeatFlux	Latent Heat Flux
SensibleHeatFlux	Sensible Heat Flux
Obukhov	Obukhov length
BoundaryLayerHeight	Height of planetary boundary layer defined by constant potential temperature
BufferLayerHeight	Height of Buffer Layer typically marked by a distinct temperature inversion
MixedLayerHeight	Height of the planetary boundary layer defined by an aerosol particle gradient
Insolation	Amount of solar radiation reaching the Earth's surface
RainAccumulation	The cumulative amount of rain over a defined period of time
RainDuration	The period of time in which continuous rainfall is observed
RainRate	The intensity of rain over a specified interval of time
HailAccumulation	The cumulative amount of hail over a defined period of time
HailDuration	The period of time in which continuous hail is observed
HailRate	The intensity of hail over a specified interval of time

2.5 Platform Navigation and Attitude Standard Names

This group of standard names is for variables describing measurement platform (e.g., aircraft, ship, and motor vehicles) location and attitude (if applicable) as a function of sampling time. The value of MeasurementCategory for this group is "Platform". CoreNames for navigation variables are listed in Table 17. There is no need for further description (i.e., DescriptiveAttributes always has the value of "None"), and the AcquisitionMethod is always "InSitu".

Platform Navigation:
Platform_CoreName_AcquisitionMethod_None
AcquisitionMethod = InSitu

Example of an in-situ measurement for aircraft Yaw angle: Platform_YawAngle_InSitu_None

Table 17: List of CoreNames for Measurement Platform Navigation and Attitude

CoreName	Description
Latitude	The angle between the equatorial plane and the straight line that passes through a point of interest and through (or close to) the center of the Earth
Longitude	The angle east or west of a reference meridian to another meridian that passes through a point of interest
AltitudePressure	Elevation above a standard datum air-pressure plane
AltitudeAGL	Height above ground level
AltitudeMSL	Height above mean sea surface level
AltitudeEllipsoid	Height above Ellipsoid**
AltitudeGeoid	Height about Geoid
HeadingTrue	Direction of nose orientation, positive cardinal north
HeadingMagnetic	Direction of nose orientation, positive magnetic north
TrackAngle	Vehicle track over ground reference, positive cardinal north
DriftAngle	Angle difference between HeadingTrue and TrackAngle
PitchAngle	Angle between horizontal axis and the longitudinal axis of the vehicle, positive nose up
RollAngle	Angle between horizontal axis and the lateral axis of the vehicle, positive right wing down
YawAngle	Angle about a vertical axis between vehicle longitudinal axis and the direction of motion of the vehicle, positive right
AngleofAttack	Angle between the chord line of the aircraft and the relative wind
AircraftTrueAirSpeed	Speed of air flow with respect to the aircraft
GroundSpeed	Horizontal speed of vehicle with respect to the earth's surface
AircraftIndicatedAirSpeed	Derived vehicle speed from pitot-static system components (Static and Impact pressure)

** Reference ellipsoid must be defined in variable long name and/or in file header

2.6 Photolysis Rate Standard Names

The MeasurementCategory for photolysis rate variables is either GasJvalue for gas phase photolysis or AquJvalue for aqueous phase photolysis processes. The CoreNames for the photolysis rates (Table 18) consist of "j" plus the CoreName of the gas phase reactants previously given in Table 4. There are no aqueous phase photolysis rate coefficient measurements from current suborbital field studies. The AcquisitionMethod is "InSitu". Three DescriptiveAttributes are associated with the photolysis variables: "MeasurementDirection", "SpectralCoverage", and "Products". MeasurementDirection describes if the photolysis rates are derived from downwelling, upwelling, or total (Downwelling and Upwelling) actinic flux measurements. SpectralCoverage indicates whether the spectral range of the measurement spans the entire range of photolysis or only a partial range (e.g., UV/Visible range only), and Products is used to list the products from photolysis reactions, separated by a hyphen ("-"). If no specific products are identified in the photolysis reaction, "Products" has the value of "NoProductsSpecified".

Photolysis Rates:

MeasurementCategory_CoreName_AcquisitionMethod_MeasurementDirection_SpectralCoverage_Products
MeasurementCategory = GasJvalue or AquJvalue
AcquisitionMethod = InSitu
MeasurementDirection = Downwelling, Upwelling, or Total
SpectralCoverage = Partial, Full

Example of photolysis rate coefficient for reaction NO2 + hv → NO + O(3P) derived from total actinic flux measurement:
GasJvalue_jNO2_InSitu_Total_Full_NO2-O3P

Example of photolysis rate coefficient for reaction CHBr3 + hv → products derived from downwelling actinic flux measurement:
GasJvalue_jCHBr3_InSitu_Downwelling_Full_NoProductsSpecified

Example of photolysis rate coefficient for reaction HNO4 + hv → HO2 + NO2 derived from total actinic flux measurement:
GasJvalue_jHNO4_InSitu_Total_Partial_HO2-NO2

Table 18: List of CoreNames for Gas Phase Photolytic Rate Coefficients

CoreName	**Definition**
jO3	Rate Coefficient for Photolysis of Ozone
jNO2	Rate Coefficient for Photolysis of Nitrogen Dioxide
jH2O2	Rate Coefficient for Photolysis of Hydrogen Peroxide

CoreName	Definition
jNO3	Rate Coefficient for Photolysis of Nitrate Radical
jN2O5	Rate Coefficient for Photolysis of Nitrogen Pentoxide
jHNO2	Rate Coefficient for Photolysis of Nitrous Acid
jHNO3	Rate Coefficient for Photolysis of Nitric Acid
jHNO4	Rate Coefficient for Photolysis of Peroxynitric acid
jCH2O	Rate Coefficient for Photolysis of Formaldehyde
jCH3CHO	Rate Coefficient for Photolysis of Acetaldehyde
jPropanal	Rate Coefficient for Photolysis of Propanal
jCH3OOH	Rate Coefficient for Photolysis of Methyl Hydroperoxide
jMeONO2	Rate Coefficient for Photolysis of Methyl Nitrate
jEthONO2	Rate Coefficient for Photolysis of Ethyl Nitrate
jPAN	Rate Coefficient for Photolysis of Peroxyacetyl Nitrate
jMAC	Rate Coefficient for Photolysis of Methacrolein
jMVK	Rate Coefficient for Photolysis of Methyl Vinyl Ketone
jMEK	Rate Coefficient for Photolysis of Methyl Ethyl Ketone
jAcetone	Rate Coefficient for Photolysis of Acetone
jEthAcetate	Rate Coefficient for Photolysis of Ethyl Acetate
jMeAcetate	Rate Coefficient for Photolysis of Methyl Acetate
jCHOCHO	Rate Coefficient for Photolysis of Glyoxal
jCH3COCHO	Rate Coefficient for Photolysis of Methyl Glyoxal
j23Butanedione	Rate Coefficient for Photolysis of 2,3-Butanedione
jCl2	Rate Coefficient for Photolysis of Chlorine
jClO	Rate Coefficient for Photolysis of Chlorine Oxide
jClNO2	Rate Coefficient for Photolysis of Nitryl Chloride
jClONO	Rate Coefficient for Photolysis of ClONO
jClONO2	Rate Coefficient for Photolysis of Chlorine Nitrate
jBr2	Rate Coefficient for Photolysis of Bromine to Br+Br

CoreName	Definition
jBrO	Rate Coefficient for Photolysis of Bromine Oxide
jHOBr	Rate Coefficient for Photolysis of Hypobromous Acid
jBrNO	Rate Coefficient for Photolysis of BrNO
jBrONO	Rate Coefficient for Photolysis of BrONO
jBrONO2	Rate Coefficient for Photolysis of BrONO2
jBrNO2	Rate Coefficient for Photolysis of BrNO2
jBrCl	Rate Coefficient for Photolysis of Bromine Chloride
jCHBr3	Rate Coefficient for Photolysis of Bromoform
jButanal	Rate Coefficient for Photolysis of Butanal
jBr2O	Rate Coefficient for Photolysis of Dibromine Monoxide
jHydroxyacetone	Rate Coefficient for Photolysis of Hydroxyacetone

2.7 Radiation Standard Names

The "Rad" MeasurementCategory is a group of standard names that describe radiation measurement variables. The AcquisitionMethod for this category is always "InSitu", and possible CoreNames are given in Table 19. There is only one DescriptiveAttribute, "WLMode", which refers to the spectral measurement mode. WLmode may be three options: "BB" for broadband measurements, "SP" for spectral measurements, and "SC" for measurement-specific spectral channels. While measurement spectral range is important, fully describing it requires specific wavelength information, which is beyond the scope of the broad ranges and controlled vocabulary of standard names. Specific spectral range information should be given in the variable description, e.g., in the long variable name in the ICARTT format.

Radiation Measurements:

Standard Name = Rad_CoreName_InSitu_WLMode
WLMode = BB (broadband), SP (spectral), or SC (specific channels)

Example of an in-situ measurement of Downwelling Diffuse Broadband Solar Irradiance between 0.2 and 3.6 micron: Rad_IrradianceDownwellingDiffuse_InSitu_BB

Table 19: List of CoreNames for Radiation Measurements

CoreName	Definition
Radiance	Radiant flux emitted, reflected, transmitted or received by a surface, per unit solid angle per unit projected area

RadianceDownwellingZenith	Radiant flux emitted, reflected, transmitted or received by a surface, per unit solid angle per unit projected area, for the radiance measured via a narrow field of view pointed directly at zenith, usually under clouds.
RadianceDownwellingSky	Radiant flux emitted, reflected, transmitted or received by a surface, per unit solid angle per unit projected area, for the radiance measured via a narrow field of view pointed at defined points in the sky, sampling diffuse skylight.
IrradianceDownwellingDirect	Radiant flux received by a surface per unit area, i.e., downwelling direct component of irradiance
IrradianceDownwellingDiffuse	Radiant flux received by a surface per unit area, i.e., downwelling diffuse component of irradiance
IrradianceDownwelling	Radiant flux received by a surface per unit area (downwelling). For solar radiation this is also referred to as global (diffuse and direct) solar irradiance
IrradianceUpwelling	Radiant flux received by a surface per unit area (upwelling)
ActinicFlux	Spherically integrated solar radiation flux in the earth's atmosphere
ActinicFluxDownwelling	Spherically integrated solar radiation flux in the earth's atmosphere, i.e., downwelling component of actinic flux (uncorrected for aircraft attitude)
ActinicFluxUpwelling	Spherically integrated solar radiation flux in the earth's atmosphere, i.e., upwelling component of actinic flux (uncorrected for aircraft attitude)

3 Maintenance and Future

This document is intended to be a living document. To stay relevant to the measurements and user community, CoreNames and Descriptive Attributes will be updated and/or modified after each major field campaign. The process for creating new CoreNames will involve the collection of new measurements from the principle investigator, review through literature search and peer comments, and following a similar structure to current measurements. To date, the current list of atmospheric composition standard names has been successfully implemented in the FIREX-AQ, CAMP^{2}EX, and ACTIVATE field campaigns. With the help of the field campaign PIs over one hundred new measurement core names have been added to this document since prior to these campaign data submissions. This document will be maintained by Morgan Silverman and the Earth Venture-SubOrbital Support Team (EV-SOS) at the NASA Langley Atmospheric Science Data Center.

4 References

Informative References

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