GEOMS compliant HDF files for FTIR
Changes, Versioning + Discussion
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Aims

- *What is GEOMS?*

- *Data Versioning changes*

- *Discussion on proposed update of the reporting template*

What is GEOMS?

*GEOMS – **Generic Earth Observation Metadata Standard** is a metadata standard used for archiving data from ground-based networks, like NDACC, so it can be used for the validation of NASA and ESA satellite data*

Facilitate portability and accessibility of data and make contents self-describing

Documentation and Tools –** available on the AVDC and EVDC web-sites* https://avdc.gsfc.nasa.gov/ ***and http://evdc.esa.int/

***Tools –** include IDL programs to create and read GEOMS-compliant files, and to convert between HDF4, HDF5 and netCDF*

On-line Tools
- *QA and template checker on the AVDC web-site (use before submitting to NDACC)*   https://avdc.gsfc.nasa.gov/index.php?site=1829327959

- *GEOMS file creation tool to be available on the EVDC web-site – input data as single column ASCII file(s) and the on-line converter will create GEOMS-compliant files*

Data Versioning

GOAL – *Allow a clear way to delineate datasets from a single instrument with different processing algorithms.*

This will mean, for example that you can have two or more different processing versions from the same instrument on NDACC at the same time e.g.

groundbased_ftir.co_bira.iasb003_standard_....
vs.
groundbased_ftir.co_bira.iasb003_stratomeso_....
groundbased_ftir.co_bira.iasb003_velazco2007_....?

HOW – *add an optional third field to the DATA_SOURCE global attribute*

This field will then directly identify a particular variant of a dataset and will mean any files with that name can be treated as a continuous time-series. The DATA_FILE_VERSION now points to a sub-version within that specific data/algorithm variant. It refers to small/minor changes e.g. fixing an error in previously submitted data

Data Versioning

GUIDELINES:

- *Working Groups work with providers to determine suitable variant names*
- *Standardized names vs. Flexibility*

  - *Standard names associated with common applications e.g. CALVAL, INHOUSE, HIRES, WEEKLY*
  - *Other names will be specific to a particular instrument type or processor, so may only be used by a single group or limited number of groups*

- *Database of version names to be maintained by NDACC and GEOMS to avoid possible conflicts*

IMPLEMENTATION: *The new Data Versioning rules will be presented at the next NDACC SC meeting (October) for approval, with the aim to put the guidelines in place at that time*

Why update the template?

- *Add value/information (e.g. source variables)*
- *Current template is not GEOMS compliant*
- *Clearer definitions of variables*

Timeline

- *Coincide with the introduction of the new 'Data Versioning' rules*
- *Combine with any other changes proposed by the WG (HITRAN 2016)*
- *October/November 2019 (after NDACC SC meeting)*

Proposed FTIR Template

Variable	Dimension	Unit	Type	Description	
DATETIME	DATETIME	MJD2K	DOUBLE	Mean of the zero path difference times of the individual scans that were averaged to produce the fitted spectrum	x
~~DATETIME.START~~	~~DATETIME~~	~~MJD2K~~	~~DOUBLE~~	~~Start time of the measurement~~	~~x~~
~~DATETIME.STOP~~	~~DATETIME~~	~~MJD2K~~	~~DOUBLE~~	~~End time of the measurement~~	~~x~~
INTEGRATION.TIME	DATETIME	s	REAL	Duration of the measurement corresponding to the retrieved datapoint	x
LATITUDE.INSTRUMENT	CONSTANT	deg	REAL	Inst. geolocation (+ for north; - for south)	x
LONGITUDE.INSTRUMENT	CONSTANT	deg	REAL	Inst. geolocation (+ for east; - for west)	x
ALTITUDE.INSTRUMENT	CONSTANT	m	REAL	Inst. Geolocation	x
SURFACE.PRESSURE_INDEPENDENT	DATETIME	hPa	REAL	Surface/ground pressure	x
SURFACE.PRESSURE_INDEPENDENT_SOURCE	[CONSTANT|DATETIME]	[empty]	STRING	Surface/ground pressure profile source (e.g. Mercury barometer etc.)	x
				if SURFACE.PRESSURE_INDEPENDENT is provided	
SURFACE.TEMPERATURE_INDEPENDENT	DATETIME	K	REAL	Surface/ground temperature	x
SURFACE.TEMPERATURE_INDEPENDENT_SOURCE	[CONSTANT|DATETIME]	[empty]	STRING	Surface temperature profile source (e.g. Meteorological thermometer etc.)	x
				if SURFACE.TEMPERATURE_INDEPENDENT is provided	
HUMIDITY.RELATIVE.SURFACE_INDEPENDENT	DATETIME	%	REAL	Relative humidity at the station	o
HUMIDITY.RELATIVE.SURFACE_INDEPENDENT_SOURCE	[CONSTANT|DATETIME]	[empty]	STRING	Relative humidity source (e.g. Anemometer; ECMWF etc.)	x
				if HUMIDITY.RELATIVE.SURFACE_INDEPENDENT is provided	
WIND.DIRECTION.SURFACE_INDEPENDENT	DATETIME	deg	REAL	Wind direction at the station using WMO definition (wind from the north is 360; from the east is 90 and so on no wind (calm) is 0)	o
WIND.DIRECTION.SURFACE_INDEPENDENT_SOURCE	[CONSTANT|DATETIME]	[empty]	STRING	Wind direction source (e.g. Anemometer; ECMWF etc.)	x
				if WIND.DIRECTION.SURFACE_INDEPENDENT is provided	
WIND.SPEED.SURFACE_INDEPENDENT	DATETIME	m s-1	REAL	Wind speed at the station	o
WIND.SPEED.SURFACE_INDEPENDENT_SOURCE	[CONSTANT|DATETIME]	[empty]	STRING	Wind speed source (e.g. Anemometer; ECMWF etc.)	x
				if WIND.SPEED.SURFACE_INDEPENDENT is provided	
ALTITUDE	[ALTITUDE|DATETIME;ALTITUDE]	km	REAL	Retrieval effective altitude vector (if DATETIME independent) or matrix (if DATETIME dependent). Values are monotonically increasing	x
ALTITUDE.BOUNDARIES	[ALTITUDE;INDEPENDENT|DATETIME;ALTITUDE;INDEPENDENT]	km	REAL	2D (if DATETIME independent) or 3D (if DATETIME dependent) matrix with on each row the lower and upper boundaries of the layers for which the partial columns are reported. In layer-based retrieval these are equal to the lower and upper boundaries of the respective retrieval layers	x
PRESSURE_INDEPENDENT	DATETIME;ALTITUDE	hPa	REAL	Effective air pressure at each altitude	x
PRESSURE_INDEPENDENT_SOURCE	[CONSTANT|DATETIME|DATETIME;ALTITUDE]	[empty]	STRING	Pressure profile source (e.g. Lidar; NCEP; Sonde; ECMWF etc.)	x
TEMPERATURE_INDEPENDENT	DATETIME;ALTITUDE	K	REAL	Effective air temperature at each altitude	x
TEMPERATURE_INDEPENDENT_SOURCE	[CONSTANT|DATETIME|DATETIME;ALTITUDE]	[empty]	STRING	Temperature profile source (e.g. NCEP; Sonde; ECMWF etc.)	x
DRY.AIR.COLUMN.PARTIAL_INDEPENDENT	DATETIME;ALTITUDE	Zmolec cm-2	REAL	Vertical profile of partial columns of air number densities (for conversion between VMR and partial column profile)	x
DRY.AIR.COLUMN.PARTIAL_INDEPENDENT_SOURCE	[CONSTANT|DATETIME|DATETIME;ALTITUDE]	[empty]	STRING	Partial columns of air source (e.g. NCEP etc)	x

Proposed FTIR Template

DATETIME   DATETIME   MJD2K DOUBLE   Mean of the zero path difference times of the individual scans that were averaged to produce the fitted spectrum   x
~~DATETIME.START~~   ~~DATETIME   MJD2K DOUBLE   Start time of the measurement~~   x
~~DATETIME.STOP~~   ~~DATETIME   MJD2K DOUBLE   End time of the measurement~~   x
INTEGRATION.TIME   DATETIME   s   REAL   Duration of the measurement corresponding to the retrieved datapoint   x
LATITUDE.INSTRUMENT   CONSTANT   deg   REAL   Inst. geolocation (+ for north; - for south)   x
LONGITUDE.INSTRUMENT   CONSTANT   deg   REAL   Inst. geolocation (+ for east; - for west)   x
ALTITUDE.INSTRUMENT   CONSTANT   m   REAL   Inst. Geolocation   x

SURFACE.PRESSURE_INDEPENDENT   DATETIME   hPa   REAL   Surface/ground pressure   x
SURFACE.PRESSURE_INDEPENDENT_SOURCE   [CONSTANT|DATETIME] [empty]   STRING   Surface/ground pressure profile source (e.g. Mercury barometer etc.)   x
                                                              if SURFACE.PRESSURE_INDEPENDENT is provided
SURFACE.TEMPERATURE_INDEPENDENT   DATETIME   K   REAL   Surface/ground   x
SURFACE.TEMPERATURE_INDEPENDENT_SOURCE   [CONSTANT|DATETIME] [empty]   STRING   Surfac   x

                                                   ATETIME umidit   o
                                                   [CON   TRING   x

                                                   ATETIME   deg   REAL   Wind direction a   om
                                          [CONSTANT|DATETIME] [empty]   STRING   x

                                                   ATETIME   m s-1 REAL   Wind speed at the station   x
                                          [CONSTANT|DATETIME] [empty]   STRING   Wind speed source (e.g. Anemometer; ECMWF etc.)   x
                                                              if WIND.SPEED.SURFACE_INDEPENDENT is provided
                                   E|DATETIME;ALTITUDE] km   REAL   Retrieval effective altitude vector (if DATETIME independent) or matrix (if
                                                              DATETIME dependent). Values are monotonically increasing   x
                                   E;INDEPENDENT|DATETIME;ALTITUDE;INDEPENDENT]   km   REAL2D (if DATETIME independent) or 3D (if
                                   dependent) matrix with on each row the lower and upper boundaries of the layers for which the partial columns
                                   ted. In layer-based retrieval these are equal to the lower and upper boundaries of the respective retrieval layers   x
PRESSURE_INDEPENDENT   DATETIME;ALTITUDE   hPa REAL   Effective air pressure at each altitude   x
PRESSURE_INDEPENDENT_SOURCE   [CONSTANT|DATETIME|DATETIME;ALTITUDE] [empty]   STRING   Pressure profile source (e.g. Lidar; NCEP; Sonde; ECMWF etc.)   x
TEMPERATURE_INDEPENDENT   DATETIME;   x
TEMPERATURE_INDEPENDENT_SOURCE   [CONSTAN   ; Sonde; ECMWF etc.)   x
DRY.AIR.COLUMN.PARTIAL_INDEPENDENT   DATETIME;   ities (for conversion
                                                                                             rtial column profile)   x
DRY.AIR.COLUMN.PARTIAL_INDEPENDENT_SOURCE   [CO   urce (e.g. NCEP etc)   x

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DATETIME
~~DATETIME.START~~
~~DATETIME.STOP~~
INTEGRATION.TIME
LATITUDE.INSTRUMENT
LONGITUDE.INSTRUMENT
ALTITUDE.INSTRUMENT

Changed units from km to m

**How to define DATETIME
2 possible options
1. ~~Mid-point of measurement~~** (IRWG 190523)
**or
2. Zero Optical Path difference**

~~Possible new variables~~ (IRWG 190523)
~~(if included will change global attributes DATA_START_DATE and DATA_STOP_DATE)~~

Proposed FTIR Template

DATETIME   DATETIME   MJD2K DOUBLE   Mean of the zero path difference times of the individual scans that were averaged to produce the fitted spectrum   x

* Reporting of
surface pressure
and temperature
mandatory
(IRWG 190523)

Only temperature and pressure included in v2.
* All optional. If reported then it is mandatory to report
the source (note: optional dependencies). If reporting
surface wind both speed and direction must be included

if SURFACE.PRESSURE_INDEPENDENT is provided

DATETIME   K   REAL   Surface/ground temperature   x
SURFACE.TEMPERATURE_INDEPENDENT_SOURCE   [CONSTANT|DATETIME]   [empty]   STRING Surface temperature profile source (e.g. Meteorological thermometer etc.)   x
                                         if SURFACE.TEMPERATURE_INDEPENDENT is provided
HUMIDITY.RELATIVE.SURFACE_INDEPENDENT   DATETIME   %   REAL   Relative humidity at the station   o
HUMIDITY.RELATIVE.SURFACE_INDEPENDENT_SOURCE   [CONSTANT|DATETIME] [empty]   STRING   Relative humidity source (e.g. Anemometer; ECMWF etc.)   x
                                         if HUMIDITY.RELATIVE.SURFACE_INDEPENDENT is provided
WIND.DIRECTION.SURFACE_INDEPENDENT   DATETIME   deg   REAL   Wind direction at the station using WMO definition (wind from the north is 360; from
                                             the east is 90 and so on no wind (calm) is 0) o

SURFACE.PRESSURE_INDEPENDENT
SURFACE.PRESSURE_INDEPENDENT_SOURCE
SURFACE.TEMPERATURE_INDEPENDENT
SURFACE.TEMPERATURE_INDEPENDENT_SOURCE
HUMIDITY.RELATIVE.SURFACE_INDEPENDENT
HUMIDITY.RELATIVE.SURFACE_INDEPENDENT_SOURCE
WIND.DIRECTION.SURFACE_INDEPENDENT
WIND.DIRECTION.SURFACE_INDEPENDENT_SOURCE
WIND.SPEED.SURFACE_INDEPENDENT
WIND.SPEED.SURFACE_INDEPENDENT_SOURCE

Wind direction source (e.g. Anemometer; ECMWF etc.)   x
                    if WIND.DIRECTION.SURFACE_INDEPENDENT is provided
the station   o
d speed source (e.g. Anemometer; ECMWF etc.)   x
                    if WIND.SPEED.SURFACE_INDEPENDENT is provided
al effective altitude vector (if DATETIME independent) or matrix (if
        DATETIME dependent). Values are monotonically increasing   x
ENDENT]   km   REAL2D (if DATETIME independent) or 3D (if
wer and upper boundaries of the layers for which the partial columns
b the lower and upper boundaries of the respective retrieval layers   x
ure at each altitude   x
| STRING Pressure profile source (e.g. Lidar; NCEP; Sonde; ECMWF etc.)   x
erature at each altitude   x
        STRING Temperature profile source (e.g. NCEP; Sonde; ECMWF etc.)   x
 profile of partial columns of air number densities (for conversion
            between VMR and partial column profile)   x
[empty]   STRING   Partial columns of air source (e.g. NCEP etc)   x

Proposed FTIR Template
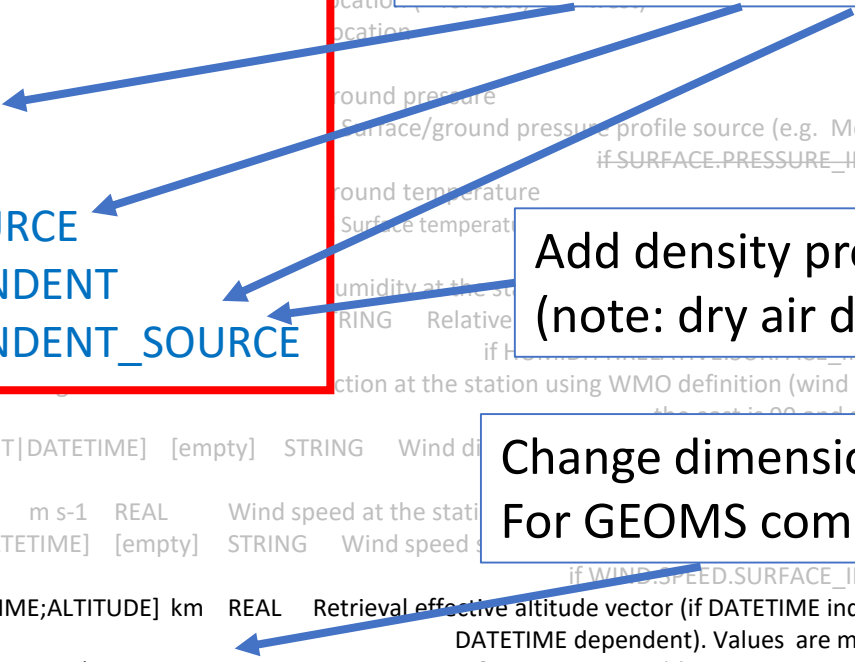
DATETIME	DATETIME	MJD2K DOUBLE	Mean of the zero path difference times of the individual scans that were averaged to produce the fitted spectrum		x
DATETIME.START		DATETIME	MJD2K DOUBLE	Start time of th…	x

ALTITUDE
ALTITUDE.BOUNDARIES
PRESSURE_INDEPENDENT
PRESSURE_INDEPENDENT_SOURCE
TEMPERATURE_INDEPENDENT
TEMPERATURE_INDEPENDENT_SOURCE
DRY.AIR.COLUMN.PARTIAL_INDEPENDENT
DRY.AIR.COLUMN.PARTIAL_INDEPENDENT_SOURCE

Add source variables
(note: optional dependencies)

Add density profile
(note: dry air designation)

Change dimension ordering
For GEOMS compliance

(faded background text:)
…of the
…of the
…ocatio…
…ocatio…
…ocatio…
…round pressure
Surface/ground pressure profile source (e.g. Mercury barometer etc.)   x
if SURFACE.PRESSURE_INDEPENDENT is provided
…round temperature
Surface temperatur…
…umidity at the st…
STRING   Relative…
if H…
…ction at the station using WMO definition (wind from the north is 360; from
…the eas…is 90 and so on no wind (calm) is 0)

WIND.DIRECTION.SURFACE_INDEPENDENT_SOURCE [CONSTANT|DATETIME] [empty] STRING Wind di… x
WIND.SPEED.SURFACE_INDEPENDENT DATETIME m s-1 REAL Wind speed at the stati… o
WIND.SPEED.SURFACE_INDEPENDENT_SOURCE [CONSTANT|DATETIME] [empty] STRING Wind speed s… x
if WIND.SPEED.SURFACE_INDEPENDENT is provided

ALTITUDE	[ALTITUDE|DATETIME;ALTITUDE] km REAL	Retrieval effective altitude vector (if DATETIME independent) or matrix (if DATETIME dependent). Values are monotonically increasing			x
ALTITUDE.BOUNDARIES	[ALTITUDE;INDEPENDENT|DATETIME;ALTITUDE;INDEPENDENT] km REAL2D (if DATETIME independent) or 3D (if DATETIME dependent) matrix with on each row the lower and upper boundaries of the layers for which the partial columns are reported. In layer-based retrieval these are equal to the lower and upper boundaries of the respective retrieval layers			x
PRESSURE_INDEPENDENT	DATETIME;ALTITUDE hPa REAL Effective air pressure at each altitude				x
PRESSURE_INDEPENDENT_SOURCE	[CONSTANT|DATETIME|DATETIME;ALTITUDE] [empty] STRING Pressure profile source (e.g. Lidar; NCEP; Sonde; ECMWF etc.)				x
TEMPERATURE_INDEPENDENT	DATETIME;ALTITUDE K REAL Effective air temperature at each altitude				x
TEMPERATURE_INDEPENDENT_SOURCE	[CONSTANT|DATETIME|DATETIME;ALTITUDE] [empty] STRING Temperature profile source (e.g. NCEP; Sonde; ECMWF etc.)				x
DRY.AIR.COLUMN.PARTIAL_INDEPENDENT	DATETIME;ALTITUDE Zmolec cm-2 REAL Vertical profile of partial columns of air number densities (for conversion between VMR and partial column profile)				x
DRY.AIR.COLUMN.PARTIAL_INDEPENDENT_SOURCE	[CONSTANT|DATETIME|DATETIME;ALTITUDE] [empty] STRING Partial columns of air source (e.g. NCEP etc)				x

Proposed FTIR Template

Variable	Dimensions	Units	Type	o/x
[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]	DATETIME;ALTITUDE	[ppmv|ppbv|pptv]	REAL	o
[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]_APRIORI	DATETIME;ALTITUDE	[ppmv|ppbv|pptv]	REAL	x
	if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR] is provided			
[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]_AVK	DATETIME;ALTITUDE;ALTITUDE	1	REAL	x
	if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR] is provided			
[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.RANDOM.COVARIANCE	DATETIME;ALTITUDE;ALTITUDE	[ppmv2|ppbv2|pptv2]	REAL	x
	if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR] is provided			
[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.SYSTEMATIC.COVARIANCE	DATETIME;ALTITUDE;ALTITUDE	[ppmv2|ppbv2|pptv2]	REAL	x
	if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR] is provided			
~~[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.COMBINED.COVARIANCE~~	~~DATETIME;ALTITUDE;ALTITUDE~~	~~[ppmv2|ppbv2|pptv2]~~	~~REAL~~	~~x~~
	~~if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR] is provided~~			
[GAS].COLUMN.PARTIAL_ABSORPTION.[SOLAR|LUNAR]	DATETIME;ALTITUDE	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
	if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR] is provided			
[GAS].COLUMN.PARTIAL_ABSORPTION.[SOLAR|LUNAR]_APRIORI	DATETIME;ALTITUDE	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]	DATETIME	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_APRIORI	DATETIME	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_AVK	DATETIME;ALTITUDE	1	REAL	x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.RANDOM.STANDARD	DATETIME	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.SYSTEMATIC.STANDARD	DATETIME	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
~~[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.COMBINED.STANDARD~~	~~DATETIME~~	~~molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)~~	~~REAL~~	~~x~~
ANGLE.[SOLAR|LUNAR]_ZENITH.ASTRONOMICAL	DATETIME	deg	REAL	x
ANGLE.[SOLAR|LUNAR]_AZIMUTH	DATETIME	deg	REAL	x
LATITUDE	[DATETIME|DATETIME;ALTITUDE]	deg	REAL	o
LONGITUDE	[DATETIME|DATETIME;ALTITUDE]	deg	REAL	o
H2O.MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]	DATETIME;ALTITUDE	[ppmv|ppbv|pptv]	REAL	x
H2O.COLUMN_ABSORPTION.[SOLAR|LUNAR]	DATETIME	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
SOURCE.PRODUCT	INDEPENDENT	[empty]	STRING	o
	Original archived FTIR file name in form Original_Archive;Original_Filename;Original_File_Generation_Date			

Proposed FTIR Template

[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]	DATETIME;ALTITUDE	[ppmv|ppbv|pptv]	REAL	o
[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]_APRIORI	DATETIME;ALTITUDE	[ppmv|ppbv|pptv]	REAL	x

if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR] is provided

[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]_AVK	DATETIME;ALTITUDE;ALTITUDE	1	REAL	x

if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR] is provided

[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR]_UNCERTAINTY.RANDOM.COVARIANCE   DATETIME;ALTITUDE;ALTITUDE   [ppmv2\|ppbv2\|pptv2]   REAL

x if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR] is provided

[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR]_UNCERTAINTY.SYSTEMATIC.COVARIANCE   DATETIME;ALTITUDE;ALTITUDE   [ppmv2\|ppbv2\|pptv2]   REAL

if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR] is provided

[GAS].MIXING.RATIO.VOLU~~ME.DRY_ABSORPTION.[SOLAR\|LUNAR]_UNCERTAINTY.COMBIN~~ED.COVARIANCE   DATETIME;ALTITUDE;ALTITUDE   [ppmv2\|ppbv2\|pptv2]   REAL

if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR] is provided

[GAS].COLUMN.PARTIAL_A~~...~~   ...ETIME;ALTITUDE   molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)   REAL

if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR] is provided

> Reporting of a profile remains optional. Add DRY designation to denote measurements wrt dry air

[GAS].COLUMN.PARTIAL_ABSORPTION.[SOLAR|LUNAR]_APRIORI	DATETIME;A...		x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]	DAT...		
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_APRIORI	DAT...		
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_AVK	DATETIME;ALTITUDE	1	REAL	x

> ~~Add~~   (IRWG 190523)
> ~~UNCERTAINTY_COMBINED_COVARIANCE~~

[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR]
[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR]_APRIORI
[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR]_AVK
[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR]_UNCERTAINTY.RANDOM.COVARIANCE
[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR]_UNCERTAINTY.SYSTEMATIC.COVARIANCE
~~[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR\|LUNAR]_UNCERTAINTY.COMBINED.COVARIANCE~~
[GAS].COLUMN.PARTIAL_ABSORPTION.[SOLAR\|LUNAR]

c cm-2)	REAL x
c cm-2)	REAL x
c cm-2)	REAL x
	REAL x
	REAL x
	REAL o
	REAL o
	REAL x
c cm-2)	REAL x
	STRING o

Original archived FTIR file name in form Original_Archive;Original_Filename;Original_File_Generation_Date

Proposed FTIR Template

[GAS].COLUMN.PARTIAL_ABSORPTION.[SOLAR|LUNAR]_APRIORI
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_APRIORI
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_AVK
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.RANDOM.STANDARD
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.SYSTEMATIC.STANDARD
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.COMBINED.STANDARD

REAL o
REAL x
is provided
REAL x
provided
[pptv2] REAL
is provided
| pptv2] REAL
is provided
| pptv2] REAL
is provided
cm-2) REAL

x if [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR] is provided

[GAS].COLUMN.PARTIAL_ABSORPTION.[SOLAR|LUNAR]_APRIORI	DATETIME;ALTITUDE	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]	DATETIME	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_APRIORI	DATETIME	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_AVK	DATETIME;ALTITUDE	1	REAL	x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.RANDOM.STANDARD	DATETIME	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.SYSTEMATIC.STANDARD	DATETIME	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.COMBINED.STANDARD	DATETIME	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x

Add   (IRWG 190523)
UNCERTAINTY_COMBINED_STANDARD

Change from conditional mandatory to mandatory

ANGLE.[SOLAR|LUNAR]_ZENITH		deg	REAL	x
ANGLE.[SOLAR|LUNAR]_AZIMU		deg	REAL	x
LATITUDE	ALTITUDE		REAL	o
LONGITUDE	[DATETIME|DATETIME;ALTITUDE]	deg	REAL	o
H2O.MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]	DATETIME;ALTITUDE	[ppmv|ppbv|pptv]	REAL	x
H2O.COLUMN_ABSORPTION.[SOLAR|LUNAR]	DATETIME	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)	REAL	x
SOURCE.PRODUCT	INDEPENDENT	[empty]	STRING	o

Original archived FTIR file name in form Original_Archive;Original_Filename;Original_File_Generation_Date

Proposed FTIR Template

[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]   TITUDE   [ppmv|ppbv|pptv]   REAL   o
[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]_APP   TITUDE   [ppmv|ppbv|pptv]   REAL   x

Add optional latitude and longitude along line-of-sight of the profile measurement

[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]_AVI   TITUDE;ALTITUDE   1   REAL   x
                                                                                 ABSORPTION.[SOLAR|LUNAR] is provided
[GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.RANDOM.COVARIANCE DATETIME;ALTITUDE;ALTITUDE [ppmv2|ppbv2|pptv2] REAL
                                                              x [GAS].MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR] is provided

; ALTITUDE;ALTITUDE   [ppmv2|ppbv2|pptv2] REAL
ME.DRY_ABSORPTION.[SOLAR|LUNAR] is provided

ANGLE.[SOLAR|LUNAR]_ZENITH.ASTRONOMICAL
ANGLE.[SOLAR|LUNAR]_AZIMUTH
LATITUDE
LONGITUDE
H2O.MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]
H2O.COLUMN_ABSORPTION.[SOLAR|LUNAR]
SOURCE.PRODUCT

; ALTITUDE;ALTITUDE   [ppmv2|ppbv2|pptv2] REAL
ME.DRY_ABSORPTION.[SOLAR|LUNAR] is provided
ME.DRY_ABSORPTION.[SOLAR|LUNAR] is provided
-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)   REAL
ME.DRY_ABSORPTION.[SOLAR|LUNAR] is provided
a unit scaled by 1E3*n ex. Pmolec cm-2) REAL   x
a unit scaled by 1E3*n ex. Pmolec cm-2) REAL   x
a unit scaled by 1E3*n ex. Pmolec cm-2) REAL   x
                                         REAL   x

[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.RANDOM.STANDARD   DATETIME   molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)   REAL   x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.SYSTEMATIC.STANDARD   DATETIME   molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)   REAL   x
[GAS].COLUMN_ABSORPTION.[SOLAR|LUNAR]_UNCERTAINTY.COMBINED.STANDARD   DATETIME   molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)   REAL   x

ANGLE.[SOLAR|LUNAR]_ZENITH.ASTRONOMICAL	DATETIME	deg		REAL x
ANGLE.[SOLAR|LUNAR]_AZIMUTH	DATETIME	deg		REAL x
LATITUDE	[DATETIME|DATETIME;ALTITUDE]	deg		REAL o
LONGITUDE	[DATETIME|DATETIME;ALTITUDE]	deg		REAL o
H2O.MIXING.RATIO.VOLUME.DRY_ABSORPTION.[SOLAR|LUNAR]	DATETIME;ALTITUDE	[ppmv|ppbv|pptv]		REAL x
H2O.COLUMN_ABSORPTION.[SOLAR|LUNAR]	DATETIME	molec cm-2 (or a unit scaled by 1E3*n ex. Pmolec cm-2)		REAL x
SOURCE.PRODUCT	INDEPENDENT	[empty]		STRING o

Original archived FTIR file name in form Original_Archive;Original_Filename;Original_File_Generation_Date

Example of changes required to become compliant with the new template

- ~~Add DATETIME.START and DATETIME.STOP variables~~

- Change the units for ALTITUDE.INSTRUMENT to m

- Change the ALTITUDE.BOUNDARIES dimension ordering

- Add an air density profile and source (DRY.AIR.COLUMN.PARTIAL_INDEPENDENT[_SOURCE])

- Add the source of the pressure and temperature profiles, and surface pressure and temperature fields

- ~~Add combined uncertainty for the measurement gas = sqrt((random uncertainty)^2 + (systematic uncertainty)^2)~~

Final Comments

- Ensure the FILE_META_VERSION value aligns with the TAV version that contains the metadata definitions used in the HDF file (this will need to be done when changing to the new reporting template)

- Writing STRING datasets to an HDF4 file is not straightforward. idlcr8hdf is set up to do this. If you have problems with this, or anything else GEOMS related then …

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