

# GEOMS templates

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# Evolution of GEOMS

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GEOMS Guidelines remain unchanged for now but there is a proposal for

1. A few **variable names changes** in the templates
2. A **GEOMS recommendations** document that stipulates recommended implementation of the general guidelines e.g., as to data file versioning



# 1. Why name changes ?

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Because the use of the GEOMS format in NORS has shown deficiencies and limitations of the reporting of the data sets, as to

**Traceability,**

**Comprehensiveness and unambiguity**

**Standardization, preferably ISO-compliance**

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# Why name changes ?

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- In NORS, all NDACC techniques are represented  $\Rightarrow$  need for harmonisation of variable names between templates for different instruments shows up
- In particular: LIDAR WG has revised uncertainty reporting (ISSI project) for **compliance with Evaluation of measurement data – Guide to the expression of uncertainty in measurement** (ISO standard)
- When data are used in completely automated processing procedures – as is the case in the NORS validation server –, then naming versus meaning of the variables must be **unambiguous** and **identical** for data from different instruments
- The name must indicate unambiguously how to process a variable, without looking into other attributes like UNITS

# Proposed changes relevant to NDACC

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1. MIXING.RATIO becomes obsolete

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MIXING.RATIO.VOLUME (ppv)

Or

MIXING.RATIO.MASS (kg/kg)

2. Uncertainty reporting

**GUM recommendations relevant to NDACC-type data:**

- we are dealing with uncertainties, not with errors
- ⇒ Already adopted in GEOMS variables names

# ....Uncertainty reporting

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- two categories of uncertainties: (A) those which can be evaluated by statistical means, and (B) those which are evaluated by other means. They do not necessarily correspond to the categories “random” and “systematic”. The GUM recommends NOT to use the term systematic.  
⇒ GEOMS sticks to ‘random’ and ‘systematic’
- Any detailed report of the uncertainty should consist of a complete list of the components, specifying for each the method used to obtain its numerical value.  
⇒ Too cumbersome to include in any data file,  
⇒ not necessarily clear nor useful for a data user  
⇒ Adopted solution in GEOMS (FTIR) templates: refer to documents/papers that are available in the open literature or on the database  
⇒ E.g., NORS guide on uncertainties budget; planned papers

# ....Uncertainty reporting

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- Uncertainties of type A are characterized by their estimated **variances**  $s^2$  (or estimated standard deviations  $s$ ). Where appropriate, **covariances** should be reported. Category B uncertainties should be characterized by quantities  $u^2$  which may be considered and treated as **approximations to the variances** (similarly for standard deviations  $u$  and covariances)
- The combined uncertainty should be characterized by the numerical value obtained by applying the usual method for the combination of variances. **The combined uncertainty and its components should be expressed in the form of "standard deviations"**.
- The term '**standard uncertainty**' is the uncertainty expressed as a standard deviation. It is considered as the more convenient way of expressing the uncertainty because it has **the same unit and dimension as the result of the measurement** , and is more easily comprehended.

# ....Uncertainty reporting *in GEOMS*

## In summary in GEOMS

- report at least a **combined standard uncertainty** (if nothing else available)
- report it as a **standard deviation** if the result of the measurement is a scalar, or as a **covariance matrix** if the result of the measurement is more-dimensional (e.g., a vector).
- **keep the notion of random and systematic uncertainties**, because these are important for data users to distinguish when averaging data, and report them separately if appropriate / possible
- **Refer in the data files to documentation** about how the estimate of the measurand (result of the measurement) and the combined standard uncertainty are obtained => reviewed papers and/or the Data User Guide and Guide to Uncertainty budgets, and make these documents available publicly.
- Adjusted GEOMS **naming conventions** to avoid any ambiguity or multiple name options for the same quantity.



# Relevant to IRWG

columns	→	<b>UNCERTAINTY.X.<u>STANDARD</u></b>	<b>Uncertainty expressed as a standard deviation, for a single uncertainty component X (e.g., TEMPERATURE), or a grouping of uncertainty components, e.g., X=RANDOM or X=SYSTEMATIC. The units are the units of the measurand.</b>
profiles	→	<b>UNCERTAINTY.X.<u>COVARIANCE</u></b>	<b>Uncertainty of a measurand that is a vector, expressed as a covariance matrix, for a single uncertainty component X (e.g., TEMPERATURE), or a grouping of uncertainty components, e.g., X=RANDOM or X=SYSTEMATIC. The units are the units of the measurand squared.</b>
profiles	→	<b>MIXING.RATIO.VOLUME</b>	

# In practice for FTIR templates

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- If agreed, new names will be published on GEOMS Web pages (on AVDC) with template version number 2
- Template version number is in the files (global attribute DATA\_TEMPLATE) so new files will refer to new template version (will be 002)
- NDACC datacenter does not have resources to make any conversion, so files based on different templates may co-exist for a while  
(Other datacenters like AVDC may create conversion tools that can be shared )

Up to PI to replace files if desired.

PI should contact Jeanette or Roger Lin if files are update / to be removed

## 2. Why GEOMS recommendations document ?

- Provide guidelines and naming conventions for uncertainty reporting
- It was found that some general GEOMS guidelines may lead to different interpretations in their implementations

E.g., as to data file versioning

For automatic data processing purposes, it must be unambiguously clear which file contains the latest version of a datapoint.

This information must come from the filename.

⇒ The recommendations document will be an online document, written and updated by members of GEOMS Board.

⇒ First version will become online on the GEOMS Web pages @ AVDC around summer 2013.