**Introduction**

Satellite datasets contribute essential inputs to the Copernicus Climate Change Service (C3S) and Atmosphere Monitoring Service (CAMS). User requirements include criteria of metrological nature, e.g., on measurement uncertainty. These target requirements are a guideline for satellite data product developers, as well as for data validators, and finally for data users to verify the fitness-for-purpose of the data product. Common agreement on the definition, expression and calculation of uncertainty terms are a prerequisite for obtaining quality-assured satellite data products, as targeted within the EC FP7 project QA4ECV and other projects pioneering the Copernicus Climate Change Service. Here, it is reported on the progress made in QA4ECV to identify discrepancies on the application of metrological terms and calculations, and also in community initiatives for harmonization.

**Rigour in terms and definitions**

Inconsistent use of terms leads to confusion. We apply the vocabulary for satellite validation, which draws for metrology from the JCGM’s *Guide to Uncertainty in Measurement* (GUM) and international *Vocabulary of Metrology* (VIM).

Examples + solution from articles and reports...

- The concepts ‘error’ and ‘uncertainty’ are used interchangeably
- Field X contains the relative *sense* of the data product...
- Accuracy is sometimes related to total uncertainty, sometimes to systematic uncertainty. Even between documents of one official body!
- GOCOS-154 “Accuracy” related to VIM’s total uncertainty definition
- GOCOS-143 “Accuracy” related to VIM’s systematic uncertainty definition

**Charting consistency in metrology of data products: survey**

Within QA4ECV, a survey about uncertainty is circulated among data producers of atmospheric ECVs (HCHO, NO2, CO, satellite-ground-based), asking for used *terminology, components* taken into account, and the *calculation method*.

**Some outcomes of the survey**

- Systematic and random errors: not always distinguished
- Uncertainty propagation on satellite signal, not always on auxiliary data
- Uncertainty due to method approximation often not included
- “Noise” does not always mean the same thing
- Uncertainty format: always ‘standard uncertainty’ (standard deviation)
- Mostly first-order uncertainty propagation, sometimes sensitivity test

**Application**

In short-term, the survey information will be used for the QA4ECV *Atmosphere ECVs Validation Server*, which ingests measured values by satellite and ground-based instruments, and the associated ex-ante uncertainties. Also within GAIA-CLIM, the survey might be circulated. In the longer term, the survey outcome can give impetus to a more harmonized view on uncertainty.

**Acknowledgements for completing the survey**

Thanks to F. Boersma, I. De Smedt, H. Eskes, M. George, B. Langerock, H. Worden.

**Community-driven evolution of a vocabulary for satellite validation**

Origin: GEO-CEOS 2008 workshop for a GEOSS Data Quality Strategy

Cross-disciplinary

- Metrology, remote sensing, monitoring, modelling, quality,...
- Cross-disciplinary effort
- Field-of-view: (VIM)
- Product: (ISO:9000)
- Quality indicator: (QA4EO)
- Representativeness: (Nappo)

**Vocabularies in C3S-pioneering EC projects (FP7/H2020)**

“Accuracy” in diverse vocabularies

<table>
<thead>
<tr>
<th>QA4ECV (this one)</th>
<th>GAIA-CLIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>any deviation, qualitative</td>
<td>any deviation, qualitative</td>
</tr>
<tr>
<td>systematic effect, qualitative</td>
<td>systematic effect, numerical</td>
</tr>
</tbody>
</table>

We should strive for consistency!

**Versatile QA/Validation system at BIRA-IASB**

The vocabulary list and the metrology concepts are applied in the versatile QA/Validation System operated by BIRA-IASB. See also this week:

- Arno Keppens (18/9). Overview of versatile QA/Validation System.
- Arno Keppens (poster). Validation of SCIAMACHY operational products.
- Daan Hubert (19/9). O3S-DQA - Homogeneity of ozonesonde network.
- Daan Hubert (20/9). Validation of MIPAS operational data products.

**Conclusions and outlook**

A community-driven effort within FP7/H2020 projects aims at harmonizing views on “Terms and Definitions” and metrology concepts. This is a necessary component in the provision of quality-assured atmospheric composition data and their QA/Validation, for long-term satellite missions as well as for operational services in C3S and CAMS.