Harmonious Quality Management within the Copernicus Programme

Lisa Haskell\textsuperscript{1}, Andrea Minchella\textsuperscript{1}, Pierre Féménias\textsuperscript{2}, Clément Albinet\textsuperscript{2}, Valentina Boccia\textsuperscript{2}

\textsuperscript{1} Airbus Defence and Space – Intelligence
\textsuperscript{2} European Space Agency - ESRIN
Contents

• CQC Service Overview
• Working with data from multiple sources
• Harmonisation
• Some ideas for the Future
• Conclusion
CQC Service Overview [1]

- Copernicus Coordinated data Quality Control (CQC) is an element of Copernicus Space Component Data Access (CSCDA)
  - Provided by ESA
  - Operated by Airbus DS (Intelligence-UK)
- Provides independent monitoring & assessment to ensure the quality of space data products contributing to the Copernicus Service Projects (CSPs)
- CQC managed quality information bound by the overall CSCDA model:
  - Datasets defined in response to the Data Warehouse requirements and act as "product containers";
  - Datasets populated by products supplied by the Copernicus Contributing Missions Entities (CCMEs) following specific dataset requirements;
  - Products acquired by Copernicus Contributing Missions (CCMs)
    i.e. imaging platform
CQC Service Overview [2]

CQC Tasks:

- Provide support to the integration of CCMs into the CSCDA:
  - Instrument/Product Specification (IPS)
  - Analysis of initial sample data provided by the CCMs
- Assessment of the overall data quality for the CSPs
- Regular monitoring of data product quality in line with the IPS
- Investigation of data quality issues;
- The identification and coordination of harmonisation initiatives
CQC Service Overview [3]

Copernicus users can access on-line:

- data quality reports and information stored in the Coordinated Data Access Infrastructure through the CQC Catalogue
- the Instrument/Product Specification (IPS) through a Visualisation Tool and compare information about the instruments and products available within the data offer.
- Results of CQC harmonisation initiatives

https://spacedata.copernicus.eu/web/cscda/data-offer качества-информации
Working with data from multiple sources

- > 40 missions available to the Copernicus projects – SAR and Optical

- Each presents itself differently
  - Product Quality Reports
  - Product packaging
  - Data characteristics
  - Conversion to Radiance/Reflectance
  - SAR calibrations

- We need flexibility to deal with new and updated products – but we need a uniform output to allow clear comparisons.
Harmonisation

- Technical terminology/definitions
- Metadata files, formats and contents
- Data files and formats
- Processing levels – availability and interpretation
- Processing algorithms
- Cal/Val procedures
- ……
Harmonisation of optical product types in relation to geometric corrections

Giuseppe Ottavianelli & Fabio D. Vescovi

Original Articles

ABSTRACT

The Copernicus data Quality Control (CQC) satellite data offered to the Copernicus core service are harmonised by variability of technical terms and definitions which applied geometric corrections. A comparison among CQC addresses only Optical imagery. Firstly, the paper itself and the published data addresses only Optical imagery. Secondly, the fact that it is more broadly accepted by the community describes the grouping (harmonization) of the products which have undergone the same (or similar) corrections into broad harmonised categories. Five classes are defined, i.e., Raw, Basic, Georeferenced, Georectified and Orthorectified; these can be considered as harmonised product types for all optical products offered as the EOS market.

<table>
<thead>
<tr>
<th>CQC Product class</th>
<th>Distortions in the product</th>
<th>Applied corrections</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw</td>
<td>Internal and external sensor distortions. Band mis-alignment. Distortions due to image not yet projected to a geographic coordinate system. Distortions due to topography.</td>
<td>None.</td>
<td></td>
</tr>
<tr>
<td>Basic</td>
<td>Band mis-alignment. Distortions due to image not yet projected to a geographic coordinate system. Distortions due to topography.</td>
<td>Parametric model to correct internal and external distortions.</td>
<td></td>
</tr>
<tr>
<td>Georeferenced</td>
<td>Distortions due to image not yet projected to a geographic coordinate system. Distortions due to topography.</td>
<td>Band alignment.</td>
<td>Layers of latitude, longitude and height may be provided in metadata. Alternatively a geometric model is provided to assign coordinates to pixels. But no resampling is applied.</td>
</tr>
<tr>
<td>Georectified</td>
<td>Distortions due to topography.</td>
<td>Projection to a geographic coordinate system.</td>
<td>Ellipsoid &amp; Datum are required. Addition of GCPs may improve accuracy.</td>
</tr>
<tr>
<td>Orthorectified</td>
<td>None.</td>
<td>Topographic corrections.</td>
<td>DEM is required. Addition of GCPs may improve accuracy.</td>
</tr>
</tbody>
</table>
Steps towards the future: INSPIRE

- INSPIRE Directive Established 2007
- Improve access to spatial data

INSPIRE.xml metadata file

- Orthorectified products
Steps towards the future: Product Quality Reports (PQRs)

- Data Products
- Copernicus Data Archive
- CQC Catalogue
- CDSv3
- Registered Data Users
- DIMAP with many details
- PDF with graphics
- XML file with many details
- IMD with text
Steps towards the future: Product Quality Reports (PQRs)

- Dimap with many details
- PDF with graphics
- .xml file with many details
- IMD with text

Harmonised PQR + Product Quality Index, PQI

?
Steps towards the future: Product Quality Reports (PQRs)

Common Features
- Geolocation statistics (most commonly RMSE ortho accuracy)
- Image acquisition details
- Angles
- Specific quality check results – less common (most desirable?)

Existing Quality Checks – Ask the data providers
- What are they?
- Which are the common checks?
- Where are they reported?

Unified Format
- What is best for the USER
  - PDF? XML?
- What content?
  - Brief but complete

What should feature in a harmonised PQR?
Steps towards the future: Commercial Example

Harmonisation between products and platforms within data providers

Harmonisation between data providers?

VHR Optical Europe Coverage

Unified processing stream
Conclusion

Level of Harmonisation

No/ min. harmonisation

Too many different “ways”
Most convenient for data providers
→ No good for users

Complex harmonisation

Everything is the same
Difficult for data providers
No room for innovation
→ No good for users

We are here

“Goldilocks” zone

Allows some variation between products
Room for innovation
Ideal for users
Thank you for your attention

Email: eodata_qc@copernicus.esa.int