A Semantic Representation of Product Quality and Evidence for Satellite Data

Stephan Zednik¹, Gregory Leptoukh², Christopher Lynnes³, Peter Arthur Fox¹ (phas@cs.rpi.edu), Suryaiya Ahmad² (suryaiya.ahmad@nasa.gov)

¹Rensselaer Polytechnic Institute 110th St., Troy, NY, United States
²NASA Goddard Space Flight Center, Greenbelt, MD, United States
³NASA Goddard Space Flight Center, Greenbelt, MD, United States

Finding Structure in the Complexities of Quality Information

Abstract

There is growing interest within the broad research community to leverage satellite data for cross-disciplinary analysis and to make use of the data in ways unanticipated by the data provider. Providing detailed product quality information is a significant barrier to the successful or confident integration of satellite data for many users. Researchers seek clearly and consistently characterized product quality to facilitate assessment of product fitness-for-use. We argue that data product discovery mechanisms should be augmented with facilities to present product quality information; target specific product quality assertions and related evidence based on relevant scope; and support quality of other like products.

We propose a method of provisioning product quality into aspects (e.g., completeness, bias, compliance) and displaying computed and inferred facts to evidence subjective quality assertions about data. We describe the product quality ontology developed to facilitate this characterization of product quality. Finally, we illustrate the utility of this approach by showing how we have applied it to a prototype implementation of the NASA Giovanni Data Access and Analysis Tool.

Inspiration – Quality Fact Label

What if quality information about scientific data products was as easy to view and use as a standard FDA nutrition label?

Quality Facts

Scope: Global, Daily Data
Product: MODIS Aerosol Optical Depth (τ)

Daily Spatial Completeness

<table>
<thead>
<tr>
<th>Global Coverage (%)</th>
<th>Good Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy (vs Aeronef)</td>
<td></td>
</tr>
<tr>
<td>Slope of Linear Regression Fit*</td>
<td>Low Underestimate Bias</td>
</tr>
<tr>
<td>Expected Error (EE) (ocean)*</td>
<td>Δt = ±0.03 ± 0.05:</td>
</tr>
<tr>
<td>Expected Error (EE) (land)**</td>
<td>Δt = ±0.05 ± 0.20:</td>
</tr>
<tr>
<td>% Within EE (ocean)*</td>
<td>64%²</td>
</tr>
<tr>
<td>% Within EE (land)**</td>
<td>67%¹</td>
</tr>
</tbody>
</table>

Measurement Characteristics

Platform: Terra
Instrument: MODIS
Collection: 5.1
Algorithm: Dark Target
Swath Width: 2330 km
Local Observing Time: 10:30
Wavelengths used for aerosol measurements (in nm):
- ocean: 466, 553, 660, 860, 1240, 1640, 2120
- land: 466, 553, 660, 2120

References


Glossary

RPI/TWC – Rensselaer Polytechnic Institute / Tetherless World Constellation
NASA/GSFC – National Aeronautics and Space Administration / Goddard Space Flight Center
MODIS – Moderate Resolution Imaging Spectroradiometer
AOD – Aerosol Optical Depth