A Semantic Representation of Product Quality and Evidence for Satellite Data

Stephan Zednik, Gregory Leptoukh, Peter Arthur Fox, Christopher Lynnes, Patrick West

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 documented and presented 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; targeted to provide a condensed and clear view of product quality and to support comparison with quality of other like products.

We propose a method of provisioning product quality into aspects (e.g. completeness, accuracy, bias) and displaying computed and inferred facts as evidence to help characterize one or more aspects of the product quality. 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 presenting product quality for the NASA MODIS Aerosol data product within a prototype implementation of the NASA Giovanni Data Access and Analysis Tool.

Inspiration

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)

<table>
<thead>
<tr>
<th>Daily Spatial Completeness</th>
<th>Accuracy (vs Aeronet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Coverage: 50%</td>
<td>Good Coverage</td>
</tr>
</tbody>
</table>

Accuracy (vs Aeronet)

- Slope of Linear Regression Fit* 0.91: Low Underestimate Bias
- Expected Error (EE) (ocean)* $\Delta = \pm 0.03 \pm 0.05$:
- Expected Error (EE) (land)** $\Delta = \pm 0.05 \pm 0.20$:
- % Within EE (ocean) 64%: Good Compliance
- % Within EE (land) 67%: Good Compliance

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

*MODIS vs Aeronet
**QA = Very Good
***QA = Marginal

References
2. Kiem et al., 2011

Mock-up of Quality Facts label for MODIS AOD Terra