Future Plans - Indexing of Research Artifacts

*Edwin Henneken and the ADS Team*

ADS Users Group Meeting, 19-20 Nov. 2020
Research Objects Stage

Research in data-intensive disciplines is increasingly consuming and generating a variety of digital resources during the course of scientific investigations. This has steadily increased the need for means to systematically capture the lifecycle of scientific investigations, which at the same time provide a single-entry point to all the related resources, including data, publications, presentations, computational resources (software, Jupyter Notebooks, protocols), and the researchers involved in the investigation.

**Goal:** enhance the sharing, preservation and communication of data-intensive science, facilitating validation, citation and reuse by the community.

**NASA:** NASA SMD Strategy WP goal: “*Improve discovery and access for all SMD data to immediately benefit science data users and improve the overall user experience*”

**ADS:** data linking, ROR, ORCID, Asclepias, DOI → Research Artifacts

ApJ paper has DOI 10.17909/t95q4x linked under “Article data” tab:

Upon publication, we will release doi:10.17909/T95Q4X, a suite of data files, coding routines, and supplementary tables to replicate this analysis.

DOI 10.17909/t95q4x is mentioned 7 times in HTML and PDF document:

- Narrative (3 times)
- Table captions (3 times)
- Appendix A (data & code availability, 1 time)

How does this DOI show up in the ADS?
What does ADS know about 10.17909/t95q4x?

The record is not indexed in the ADS...

There are 2 MAST data products, but neither corresponds with 10.17909/t95q4x
The record is not indexed in the ADS database, and there are no data products, but neither the full citation (full:10.17909/T95Q4X) nor the title "What does ADS know about 10.17909/t95q4x?" could be directly linked to specific content in the provided ADS search results.
What does ADS know about 10.17909/t95q4x?

From full text:

<label>Appendix A</label>
<title>Data Tables and Code Repository</title>
<p>Upon publication, we will release doi: <named-content content-type="dataset" xlink:href="https://doi.org/10.17909/T95Q4X">10.17909/T95Q4X</named-content>, a suite of data files, coding routines, and supplementary tables to replicate this analysis. This includes the following:</p>
<list list-type="arabic" id="apjaab9bb12">
<list-item id="apjaab9bb12.1">

The record corresponds with 10.17909/t95q4x.
More examples

ack:“10.5281/zenodo” finds 1,260 records
full:“10.5281/zenodo” finds 6,256 records

Acknowledgements

This work was supported by the LRO project and the Diviner science investigation. The Diviner Global Cumulative Products (GCP) used in this study are publicly available via the Geosciences Node of the Planetary Data System (http://pds-geosciences.wustl.edu/iro/1d-4-rtd-v1/irodt_1001/data/gcp/). The CE-2 MRM data are downloaded from http://mmn.bao.ac.cn/index_en.jsp. The improved one-dimensional thermal model used in this study can be downloaded from https://doi.org/10.5281/zenodo.3579654. The original version of the model is obtained from https://github.com/phayre/heat1d. The produced data including the bolometric Bond albedo map and loss tangent maps are available from https://doi.org/10.5281/zenodo.3575481.

Acknowledgements

This work was supported by the Environmental Defense Fund. Y. Zhang was partially funded by the Kravis Scientific Research Fund at Environmental Defense Fund (EDF). We acknowledge the data sources and science teams for the provision of publicly available data sets used in this study, namely, DOMINO v2 OMI data from KNMI (http://www.temis.nl/airpollution/no2.html), VIIRS and DMSP radiant heat and gas flaring data from NOAA (https://www.ngdc.noaa.gov/eog/viirs/download_global_flare.html), OMS02 OMI data (DOI: 10.5067/Aura/OMI/DATA 2022), MERRA-2 reanalysis (https://gmao.gsfc.nasa.gov/reanalysis/MERRA-2/), and SEAC4RS aircraft measurements data (DOI: 10.5067/Aircraft/SEAC4RS/Aerosol-TraceGas-Cloud) from NASA. We thank Ramon Alvarez from EDF for stimulating discussions during this work. We also thank two anonymous reviewers for their comments in helping improve an earlier version of this paper.
How about Jupyter Notebooks?

2019AJ....157...64L
The specific intensity at the point \((x, y)\) may be computed as

\[
I(x, y) = g(x, y) f(x, y).
\]

As we will see in the next section, integrating the surface map over the disk of the body is easier if we apply a coordinate transformation to our input vector, rotating it into what we will refer to as Green's basis, \(g\).

\[
\begin{align*}
\mathbf{f} & = (r_0, \theta, \phi) \\
\mathbf{g} & = (x, y, z) \\
\mathbf{R} & = \mathbf{f} \mathbf{g}
\end{align*}
\]

The ASTRONOMICAL JOURNAL, 157:64 (2018), 2010 February

\[
\begin{align*}
I(\mathbf{x}) & = g(\mathbf{x}) f(\mathbf{x}) \\
I(\mathbf{y}) & = g(\mathbf{y}) f(\mathbf{y}) \\
I(\mathbf{z}) & = g(\mathbf{z}) f(\mathbf{z})
\end{align*}
\]

where \(g(x, y)\) is the spherical harmonic basis, arranged in increasing degree and order.

\[
\sum_{l=0}^{\infty} \frac{(2l+1)}{2} e^{-\lambda^2} I_{l}(\mathbf{x}) = \int_{-\infty}^{\infty} \frac{1}{2\pi} \left( \int_{0}^{2\pi} I_{l}(\mathbf{x}) \sin \theta \, d\phi \right) e^{\lambda^2 \cos \theta} \sin \theta \, d\theta
\]

where \(R_{l}^{m}(x, y)\) are the spherical harmonics given by Equation (8). For reference, in this basis the coefficient of the spherical harmonic \(R_{l}^{m}(x, y)\) is located at the index

\[
[l, m, n] = [l, 0, n + \frac{1}{2} - l - \frac{1}{2}]
\]

of the vector \(n\). Conversely, the index \(n\) of the spherical harmonic \(R_{l}^{m}(x, y)\) is the corresponding vector in Green's basis, \(g\), which can be found by performing another coordinate transformation.

\[
\mathbf{A} = \mathbf{g} A
\]

where the columns of the matrix \(A\) are the Green's vectors corresponding to each of the polynomial terms in Equation (8); see Appendix B for details.

Note that we can also transform directly from the spherical harmonic basis to Green's basis.

\[
\mathbf{A} = \mathbf{g} A
\]

where \(A\) is the full-change-of-basis matrix. For completeness, we again note that the specific intensity at a point on a map described by a vector of coefficients in the polynomial basis \(\mathbf{f}\),

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The Table of Contents may be written as

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There is a record for the Jupyter Notebook environment.

It is cited by 2019AJ....157...64L.
Summary: what is **indexed** versus **linked** in the ADS

**Indexed** (an actual database record, searchable)

- The scholarly literature of interest to Astronomers
- VizieR records, IVOA standards, observing and funding proposals
- Software products: ASCL records, software packages cited via DOI
- **Upcoming:** cited data products, other research artifacts such as Jupyter notebooks

Indexed records are scholarly research artifacts. They are discoverable and can be used to create bibliographies.

**Linked** (resource accessible from a record via a link)

- Data Products hosted by external collaborators (Archives, SIMBAD, NED)

Linked data collections can be used as a filter in ADS, and to evaluate impact of linked data products.
# Data: Mention vs Citation, Now vs Upcoming

<table>
<thead>
<tr>
<th>Mention</th>
</tr>
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<tbody>
<tr>
<td><strong>URL</strong></td>
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<tr>
<td><strong>DOI</strong></td>
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<td><strong>Use cases</strong></td>
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<td>in acknowledgments:</td>
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<td>Searchable in ADS fulltext / ack fields</td>
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<tr>
<td><strong>Note: some publications have &quot;availability&quot; sections for data and software to specify the locations of data and/or software used in the publication</strong></td>
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</tr>
<tr>
<td>New record for DOI created (if necessary) and citation counted against it</td>
</tr>
</tbody>
</table>

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This page is from the VIMOS Public Extragalactic Redshift Survey (VIPERS). VIPERS has been performed using the ESO Very Large Telescope, under the "Large Programme" 182.A-0886. The participating institutions and funding agencies are listed at [link](https://www.vipers.inaf.it).