Metadata for Reuse: What does that mean?

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The Planetary Data System

Image: ASI/NASA

Aftermath of the DART mission impact as seen by the LICIACube satellite.

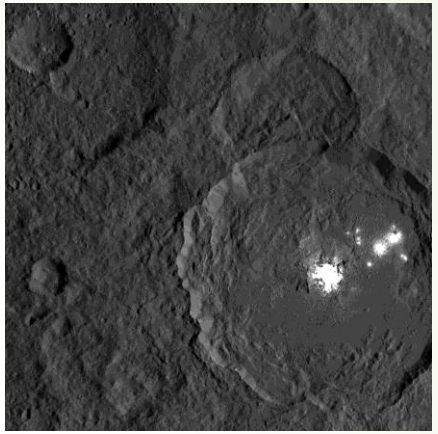


Image: NASA/JPL-Caltech/ UCLA/MPS/DLR/IDA

Occator Crater on the dwarf planet Ceres, DAWN mission.

Wreckage of the delivery capsule that carried *Perseverance* rover and *Ingenuity* helicopter to the surface of Mars, Mars2020 mission.

Image: NASA/JPL-Caltech

Interplanetary dust particle on a collector plate, Stardust mission.

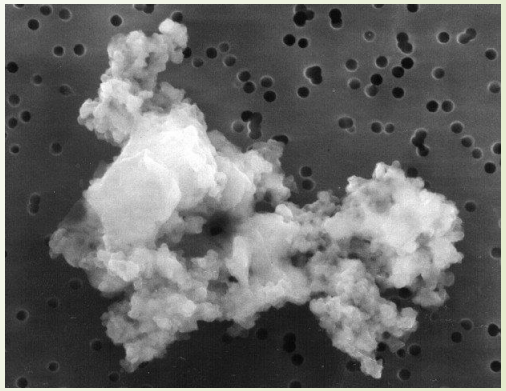


Image: NASA

What is “Reuse”?

Complementary Reuse

- Replication/Reproducibility
- Correlative Analysis
- Higher-order Dataset Creation

Metadata designed by the data creators tends to support complementary reuse very well.

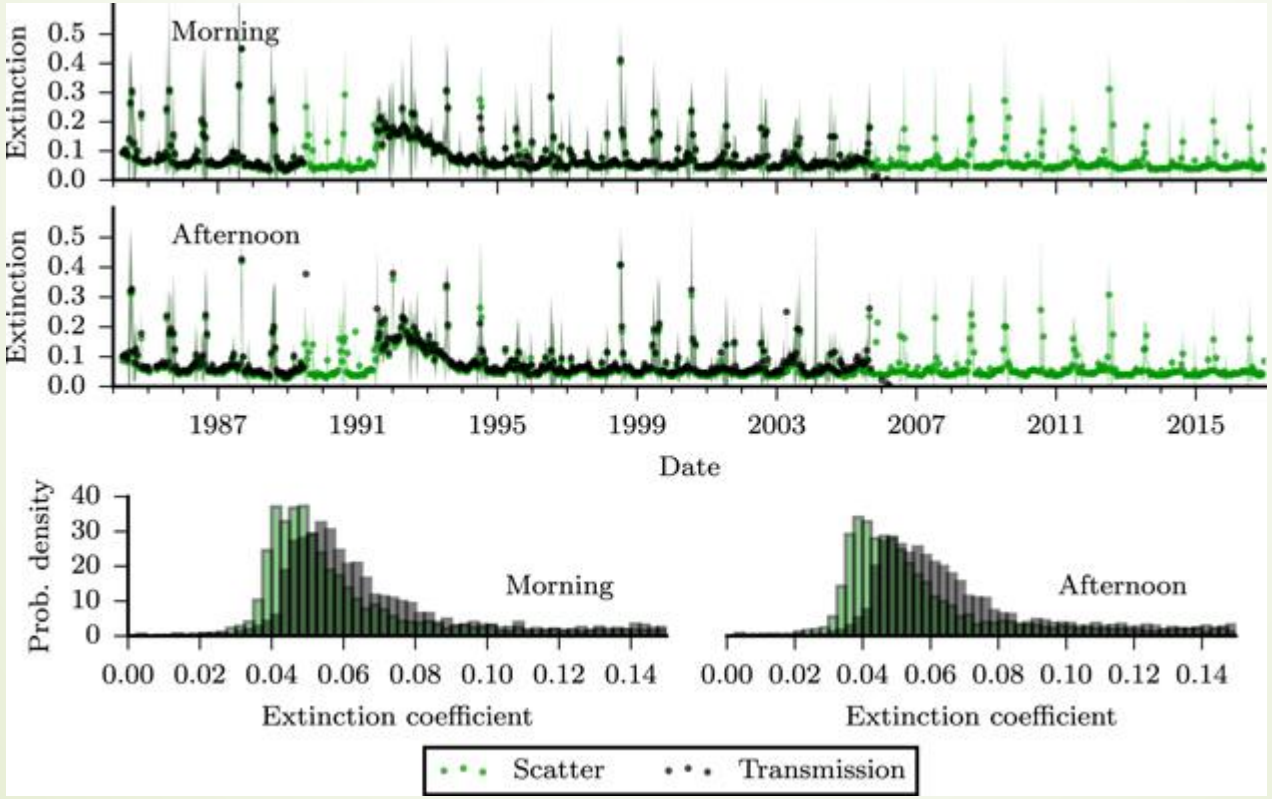
Novel Reuse

- Not related to the original investigation
- Might involve recalibration or transformation of the data
- May only use the metadata, not the data

Metadata designed by the data creators typically does not consider Novel Reuse at all.

Novel Reuse: An Example

Figure 3 from *Atmospheric Extinction Coefficients in the I_c Band for Several Major International Observatories: Results from the BiSON Telescopes, 1984-2016.* (Hale et al., 2017)



Volcanic Eruptions

Mt. Pinatubo (Philippines)
15 June 1991

El Chichón (Mexico)
28 March – 4 April 1982

Planetary Science: Targeting

Current System (simplified)

The metadata for a typical observation contains:

- Name and target type
- Inserted by pipeline processing software
- Based on the observing plan

This supports most complementary reuse reasonably well most of the time.

It does not support novel reuse based on broader or narrower elements of the physical context of the target very well.

Consider a Rock on Mars…

The complete context of the target of observation might be represented as:

- Rock Sample *12345*
  - From a Crater Rim
    - Of *Belva* Crater
      - Inside *Jezero* Crater
        - In the *Isidis Planitia* region
          - On *Mars*

Consider a Rock on Mars…

Currently, the target in the metadata is:

- *Mars*

The Task We Have Set Ourselves

- Develop an ontology of targeting for the entire PDS archive
- Design rigorous support for it into our Information Model
- Implement it in a way that makes it easy* for data creators to provide a richer target context for primary mission products

* For some value of “ease”

The Take-Away

- Metadata developers need to consciously consider novel reuse.
- Data creators should be supported and encouraged to be completely explicit in providing metadata for archiving.
- As much of the metadata as possible should be exposed to programmatic access.

Question?