

Atmospheres Data: Galileo, Mariner, Juno Migration

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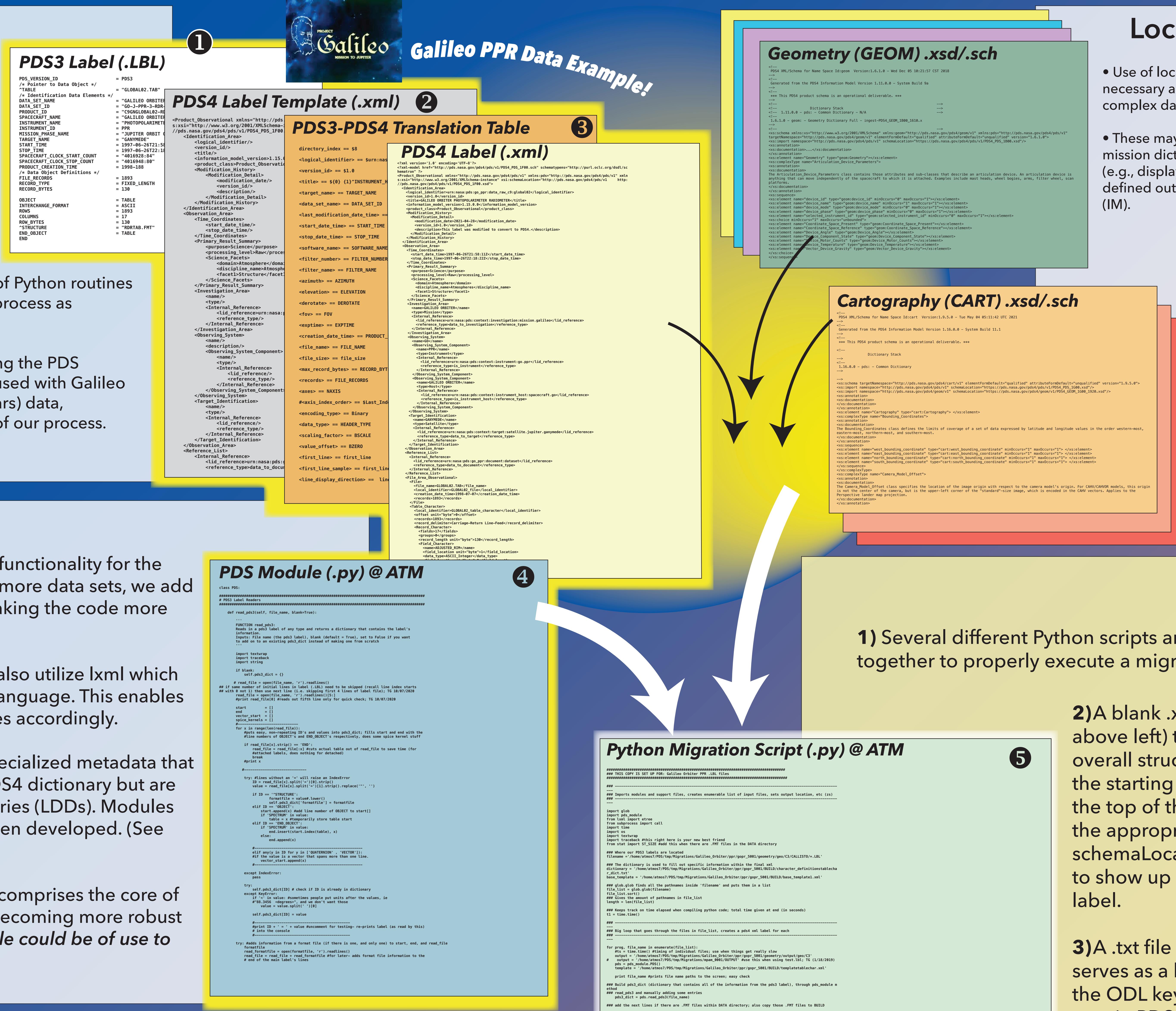
Introduction

- The PDS Atmospheres Node (ATM) is continuing the process of migrating its archived PDS3 data holdings to the PDS4 archiving standard.

- The goal of this work is to bring all data holdings up to the PDS4 standard. This will have benefits for PDS-wide search when all archived data can be included.

- ATM has developed a collection of Python routines and scripts to make the migration process as automatic as possible.

- The ATM migration code (including the PDS Module) have most recently been used with Galileo and Juno (Jupiter) and Mariner (Mars) data, demonstrating the breadth of use of our process.



PDS Module

- The PDS_Module is the core functionality for the migration code. As we migrate more data sets, we add more PDS3 to PDS4 options making the code more robust after each migration.

- The methods in this module also utilize lxml which process xml within the Python language. This enables us to modify the output .xml files accordingly.

- PDS3 labels often contain specialized metadata that are not included in the main PDS4 dictionary but are contained in local data dictionaries (LDDs). Modules for handling these have also been developed. (See above right.)

- This in-house Python module comprises the core of the translation routines and is becoming more robust with each migration. This module could be of use to migration efforts beyond ATM.

Local Data Dictionaries

- Use of local data dictionaries (LDDs) has become necessary as we have moved into migrating more complex data sets.

- These may incorporate mission attributes within a mission dictionary or discipline specific attributes (e.g., display, geometry, cartography, etc.) that are defined outside the core PDS4 Information Model (IM).

- The Python migration scripts and supporting files have been modified to properly handle these dictionaries.

- Each LDD is given in three parts:
 - XML schema file (.xsd),
 - Schematron file containing validation rules (.sch)
 - PDS4 label that describes them both (.xml). [1]

Migration Process

1) Several different Python scripts and supporting files work together to properly execute a migration.

2) A blank .xml template (gray box above left) that corresponds to the overall structure of the PDS3 label is the starting point. The declaration at the top of this template must include the appropriate targetNamespace and schemaLocation in order for those tags to show up and validate within the label.

3) A .txt file (definitions dictionary) serves as a key to translate between the ODL keywords of PDS3 to the XML tags in PDS4. This file is used to fill many of the repeated tags of the label, the LID's and/or LIDVID's, and points to the tags used within the local data dictionaries.

4) A compilation of student-written Python methods (PDS_Module) capable of handling different tables, file types, and tag-filling methods is continuously being updated/modified.

5) One main Python script is generally used per dataset to read through the PDS3 label, call the respective functions from the PDS_Module, and output PDS4 .xml files that correspond to the blank .xml template that was initially created.

Juno, Galileo and Mariner Progress

Juno:

- All 4 ATM instruments (MWR, JIRAM, UVS, Gravity) have been migrated to PDS4.
- MWR and UVS were straightforward with few complicating factors.
- JIRAM required extensive use of LDDs and special migration programming to allow for multiple images (L and M) at different observing geometries.
- Gravity (Radio Science) required separate migration scripts for ~10 different types of products.

Galileo Orbiter:

- PPR and UVS have been migrated - awaiting final validation.
- Geometry and pointing files for both instruments required additional programming to allow for different types of tables.

Mariner 6, 7, 9:

- UVS instruments for all 3 spacecraft are nearing completion.
- Documentation is somewhat limited about the structure of the files, which was solved with the help of the LASP group.

References

[1] PDS4 Data Provider's Handbook (2021) V.1.16.0, https://pds.nasa.gov/datastandards/documents/dph/current/PDS4_DataProvidersHandbook_1.16.0.pdf

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