Accessing Solar System data in telescopic archives #2: ESO

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Follow-up of IVOA presentation in fall 2022:

HST solar system data => similar extraction from ESO archive(s)

Objective:

- provide users with easy / quick access to planetary data in ESO archives
- favor exploitation of past, public datasets

Scope:

- Planets, dwarf planets, satellites, small bodies, interplanetary medium
- Science data only, possibly calibrated with automatic pipeline
- => TAP access, with description using EPNCore (IVOA Rec)

=> cross-match with ESA missions, HST archive, etc

Identifying the data / 1:

Usual issue with support of moving targets

- In the Science portal targets are identified through SIMBAD only => 'mars' or '499' (SPICE code) will provide no answer
- The raw data search interface (web page) is very handy but limited in number of answers => aimed at detailed searches

Identifying the data / 2:

ESO TAP access: two global tables providing explicit target name:

- ivoa.ObsCore: reduced data only. Starts in 2010
- dbo.raw: reduced & raw data. Starts in 1991

Must search targets by name => only feasible for main targets (not all asteroids) — and based on OB parameters, often inaccurate:

SELECT * FROM dbo.raw where(target LIKE '%moon%') and dp_cat = 'SCIENCE'

or

SELECT * FROM ivoa.ObsCore where(target_name LIKE '%moon%') and calib_level > 2

=> Identify target name / class during query Tests with various targets known to me (Ceres, Mercury, Mars, Moon, 67P...) No attempt to identify secondary targets here

- 'Mars' in ObsCore provides 1165 results
- 'Mars' in dbo.raw provides 2748 results, including a few false alerts
 Some programmes > 2010 in dbo are not included in ObsCore at all (?)
- '67P' in dbo.raw provides 11500 results, including a few false alerts
- and 'gerasimenko' another 1075

- No indication of science field => Solar System observations are not tagged (as in CAOM DM / HST) Would make search by target name much easier (target_class is even better)
- Care was obviously taken to retrieve target names from several fields, but these names may be composite or derived therefore ambiguous (*LIKE instead of =*)
 - => Need to filter false alerts / misleading names ("Moon of Neptune", "Marseille", "P267P22"...)
- => Only major targets can be identified this way small asteroids / satellites are doomed, as their names are easily included in other names (*Io, Iris, 67P...*)
- The raw obs table is currently much more complete than the ObsCore table
- Opportunity targets are not listed in proposals (*e.g. planets or bright asteroids observed during spare time*) => No certainty that all files are retrieved
- In ObsCore, calib_level is always 2 for Solar System objects. No pipeline data?
- TAP tables do not cover the complete ESO history (is it in progress?)
- No thumbnails

EPN-TAP service setup: easy

=> Mock-up service from observation list: Lunar data only

Ingestion:

- Prototype: partial conversion of ESO table via DaCHS q.rd

Data access:

- url of product / datalink look OK
- no thumbnail?

Updates:

- feasible via TAP query on daily crontab
- need to check and fix ingestion script manually for new data

Additional functionalities

- (similar to HST_planeto)
- IMCCE ephemeris can be provided though datalink
- s_region provided (on the sky) convert to ST-MOC?

Possible extensions:

- write phase angle and Ls in EPNCore table to use as search parameters (phase from the ephemeris table)
- add disk center coordinates / attitude ? (in physical ephemeris)
- Compute geometry, including secondary targets (as done in ESAsky)

Improvements?

Tagging the proposals would greatly reduce false alarms

CAOM style - Solar System should be ~ 15% of total

- Include proposal keywords (?)
- Add that manually?
- Al should be of some help can be trained on existing CAOM archives

Alternative: analyze frame content with Skybot (coord + time)

• Would also identify serendipity targets (as done in ESAsky)

By the way: publishing results from ESAsky as EPNcore would be nice!

Conclusion:

 An epn_core table dedicated to Solar System objects would be a important complement to the ObsCore one — would allow cross-searches with other EPN-TAP services

- However, conversion to EPN-TAP seems out of reach for an external team at present - *the hard point is to identify Solar System targets*

Would be a significant help to the planetary science community and an efficient way to promote the use of ESO archives Ready to help!