Some Thoughts on TAP and Other Ramblings

Ian Evans
Chandra X-ray Center Data System
End-to-End Scientist

All opinions are solely those of the author

Or….

- … how user-friendly is TAP?

- TAP presents a **flat** and rather **unfriendly** list of database table and table column names
- The scientist must spend time trying to determine which tables and columns to query
- Sometimes the names are suggestive and that may simplify the determination, but in other cases they are too closely tied to the underlying database structure to be clear
- **In any case, this should be the computer's job and not the scientist's!**

- Sometimes the **list of tables** itself can be overwhelming! (next slide)

- AtlasOutline
- DBColumns
- DBObjects
- DBViewCols
- DataConstants
- Dependency
- Diagnostics
- FIRST
- Field
- FieldProfile
- FileGroupMap
- Frame
- HalfSpace
- History
- IndexMap
- Inventory
- LoadHistory
- Mask
- MaskedObject
- PartitionMap
- PhotoObjAll
- PhotoObjDR7
- PhotoPrimaryDR7
- PhotoProfile
- Photoz
- PhotozRF
- PhotozRFTemplateCoeff
- PhotozTemplateCoeff
- Plate2Target
- PlateX
- ProfileDefs
- ProperMotions
- PubHistory
- QueryResults
- RC3
- ROSAT
- RecentQueries
- Region
- Region2Box
- RegionArcs
- RegionPatch
- Rmatrix
- Run
- RunShift
- SDSSConstants
- SiteConstants
- SiteDBs
- SiteDiagnostics
- SpecDR7
- SpecObjAll
- SpecPhotoAll
- StripeDefs
- Target
- TargetInfo
- TwoMass
- TwoMassXSC
- USNO
- Versions
- Zone
- detectionIndex
- emissionLinesPort
- galSpecExtra
- galSpecIndx
- galSpecInfo
- galSpecLine
- neighbors
- sdssBestTarget2Sector
- sdssImagingHalfSpaces
- sdssPolygon2Field
- sdssPolygons
- sdssSector
- sdssSector2Tile
- sdssTargetParam
- sdssTileAll
- sdssTiledTargetAll
- sdssTilingGeometry
- sdssTilingInfo
- sdssTilingRun
- segueTargetAll
- sppLines
- sppParams
- sppTargets
- stellarMassPCAWisc
- stellarMassPassivePort

OBSID
REVOLUT
MJD_START
MJD_STOP
OBS_CLASS
PN_FILTER
M1_FILTER
M2_FILTER
PN_SUBMODE
M1_SUBMODE
M2_SUBMODE
RA
DEC
POSERR
LII
BII
RADEC_ERR
SYSERR
RA_UNC
DEC_UNC
CX
CY
CZ
HTMID
EP_1_FLUX
EP_1_FLUX_ERR
EP_2_FLUX
EP_2_FLUX_ERR

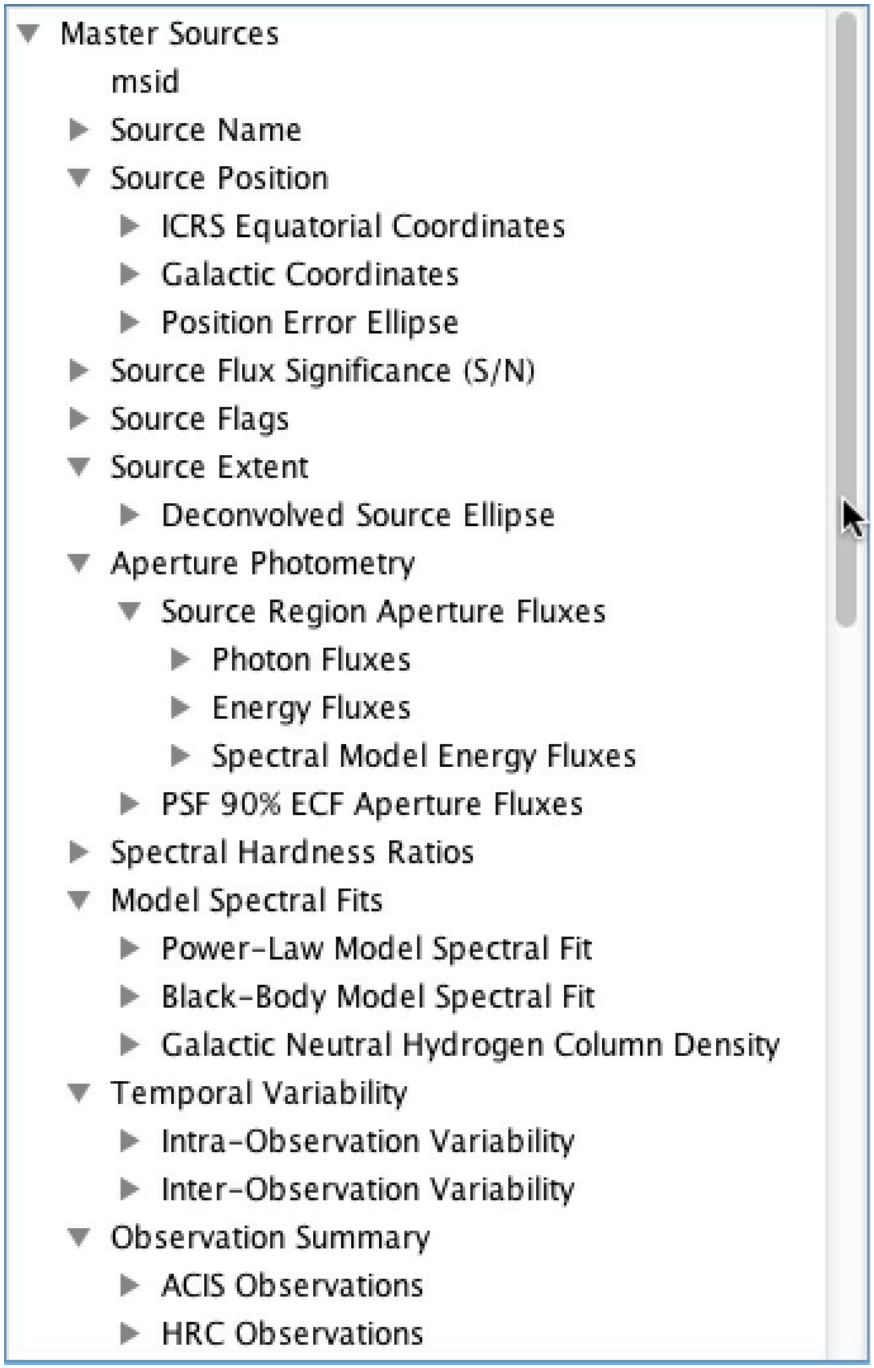
- Within a table the scientist is often faced with **a flat list of columns without any obvious underlying structure**
- Here for example, position, observation, instrument, and flux properties are all present in a single table
- This may be OK if there are only a few columns but quickly becomes unwieldy as the number increases

Name	Table	Primary Key	Datatype
flux	**public.flux**	false	real
flux_prec	**public.flux**	false	smallint

Units	UCD	Description
	instr.precision;phot.flux	flux precision

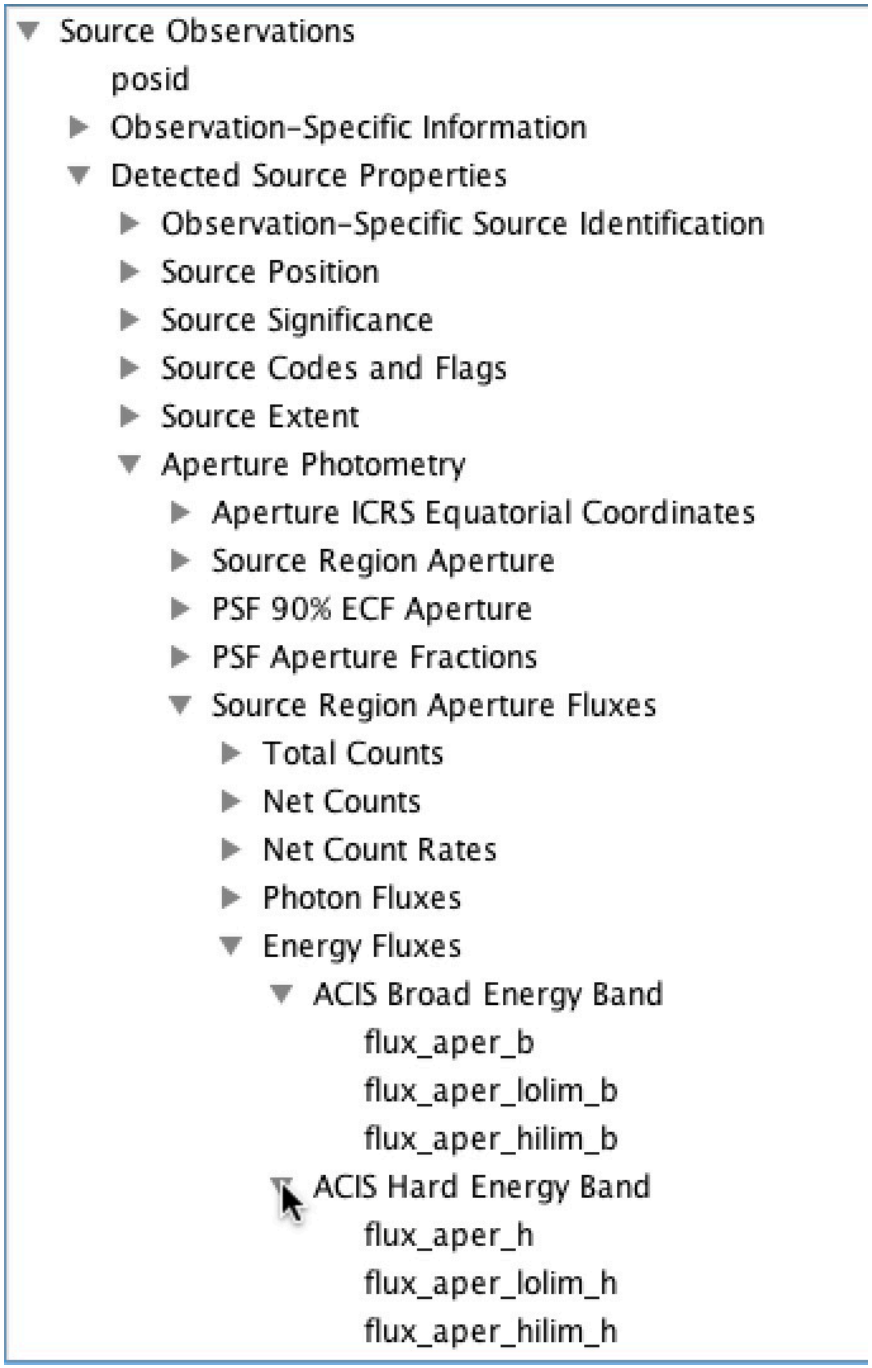
- Some metadata (units, description, UCD) about the tables and columns may be accessible (and searchable) by the scientist, but **these are not always fully and consistently populated** (see the **flux** column above)
- The **description field** could be a good heuristic to identify columns of interest if concise (e.g., the **flux precision** column above) but not if it provides an extensive description (see the example below)
- But the extended description may be essential for understanding the data content!

Name	Table	Primary Key	Datatype	Units	UCD	Description
SUM_FLAG	**twoxmm**	false	integer			The summary flag of the source is derived from EP_FLAG. It is 0 if none of the nine flags was set; it is set to 1 if at least one of the warning flags (flag 1, 2, 3, 9) was set but no possible-spurious-detection flag (flag 7, 8); it is set to 2 if at least one of the possible-spurious-detection flags (flag 7, 8) was set but not the manual flag (flag 11); it is set to 3 if the manual flag (flag 11) was set but no possible-spurious-detection flags (flag 7, 8); it is set to 4 if the manual flag (flag 11) as well as one of the possible-spurious-detection flags (flag 7, 8) is set. The meaning is thus: 0 = good, 1 = source parameters may be affected, 2 = possibly spurious, 3 = located in a area where spurious detection may occur, 4 = located in a area where spurious detection may occur and possibly spurious. .

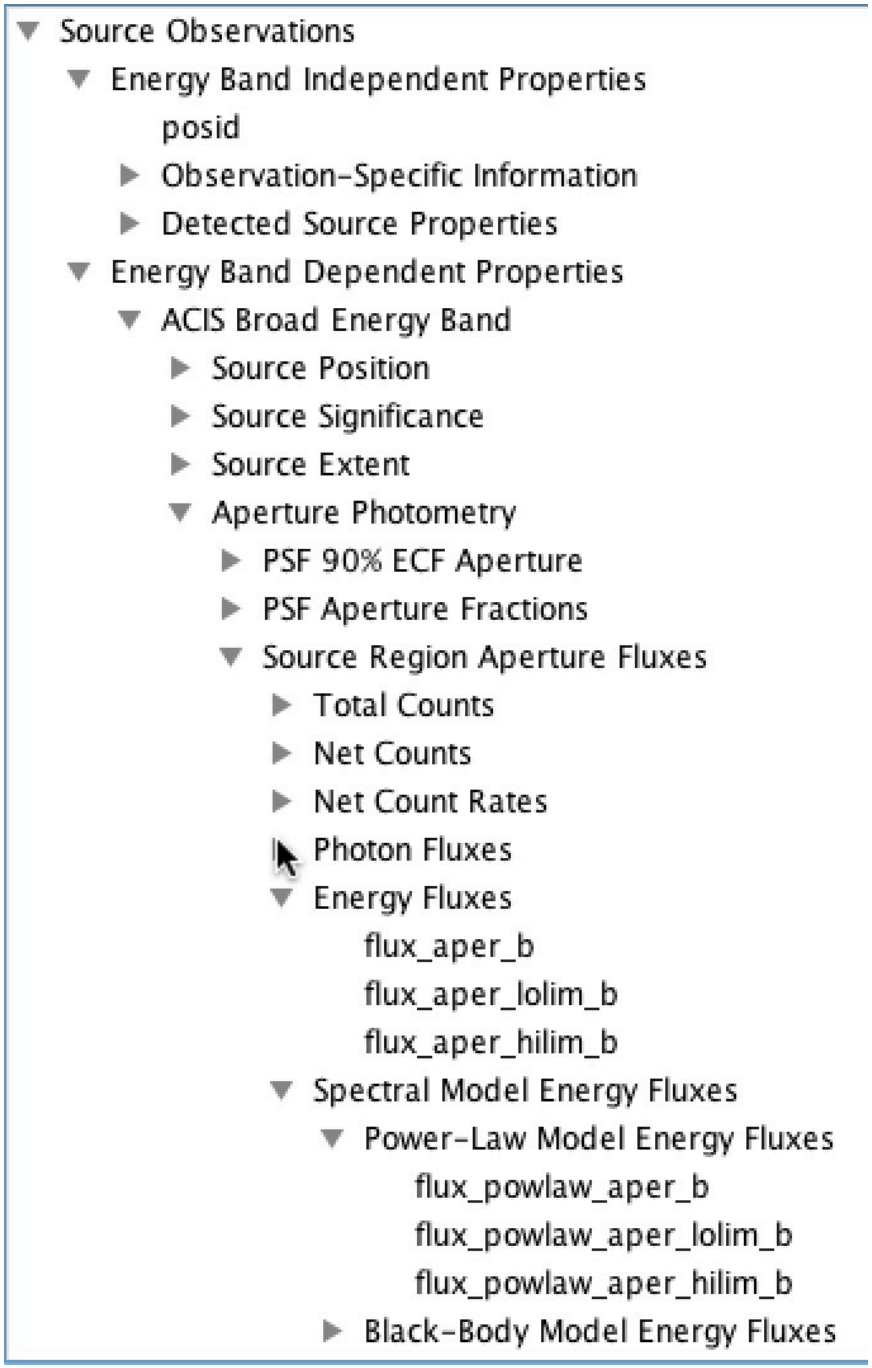


- For the *Chandra* Source Catalog query tool (CSCview) we provide a **hierarchy** of properties with **human-readable** titles
- The property titles are kept short so they can be easily displayed, but are also (hopefully) **intuitive**
- The hierarchies are kept to a few levels, so that the scientist can drill down the list of property titles quickly, e.g.

Master Sources →
Aperture Photometry →
Source Region Aperture Fluxes →
Energy Fluxes



- Only at the very bottom level does the scientist see the actual database column names
- We try to make the columns names reasonably **self-descriptive** so that a property title is not required for each column
- Metadata (datatype, units, description) are provided for each data column
- The descriptions provide the detail necessary to interpret the column data
- Because of the large number of data columns (~900) multiplexed over 6 energy bands, with most properties having separate lower and upper confidence limits we provide **multiple views of the property hierarchy**
- In this display, the hierarchy is Property → Energy Band



- Alternatively, a scientist who is primarily interested in a single energy band (e.g., the broad band) can select
  Energy Band → Property
  as the hierarchy

On Position Queries …

- A significant majority of the *Chandra* Source Catalog queries are **position searches surrounding a point**, where the user wants to **select** and **retrieve** properties for a possible X-ray source at a predefined location, e.g.,

  POINT('ICRS’, ra, dec), CIRCLE('ICRS', 40.669879, -0.013289, 0.016666667)

- However, a large fraction of TAP services **do not** support this kind of position query!
  - Out of 50 TAP services queried, only 8 (**16%**) have implemented this capability
  - Could this vitally important capability be **too hard to implement ?**

On Domain-Specific Information …

- TAP also needs to support **domain-specific representations as determined by the data provider**
  - For example, the *Chandra* Source Catalog uses the following energy bands:

Ultra-soft	u	0.2–0.5 keV	Soft	s	0.5–1.2 keV
Medium	m	1.2–2.0 keV	Hard	h	2.0–7.0 keV
Broad	b	0.5–7.0 keV	Wide	w	0.1–10 keV

  - The existing UCD's, which define em.X-ray.soft as "Soft X-ray (0.12–2 keV)" and em.X-ray.medium as "Medium X-ray (2–12 keV)" are clearly not adequate!
  - Properties such as these are certainly domain-specific and are often **facility-specific**
- **All properties should be representable using domain-specific units**
  - For example, ObsCore requires representing the spectral limits *em_min* and *em_max* in units of meters
  - For *Chandra*, that's roughly 0.0000000002 and 0.000000006
  - That may be OK for a machine to interpret but is clearly not very useful for an X-ray astronomer (not to mention the data provider) !

The Bottom Line:

- … not very