Spectroscopic Survey Pipelines for the GBT

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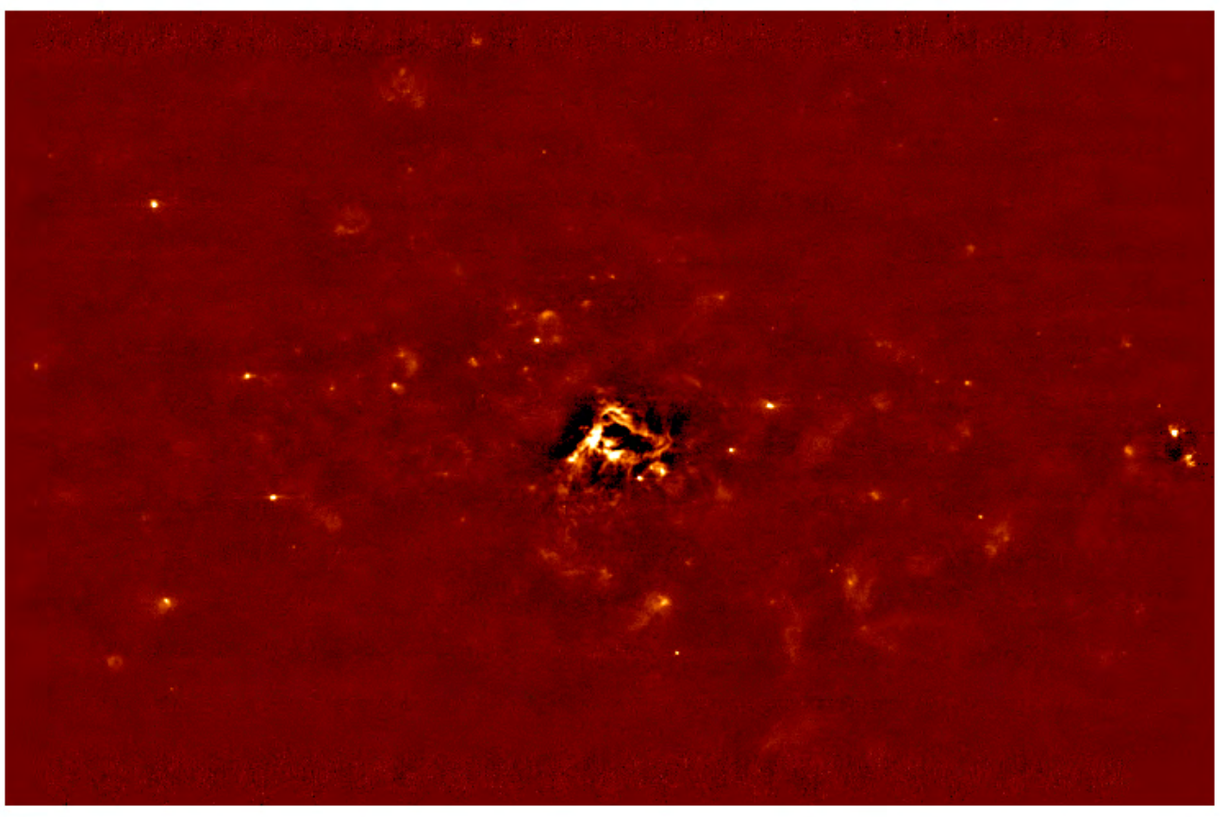
Use-Cases

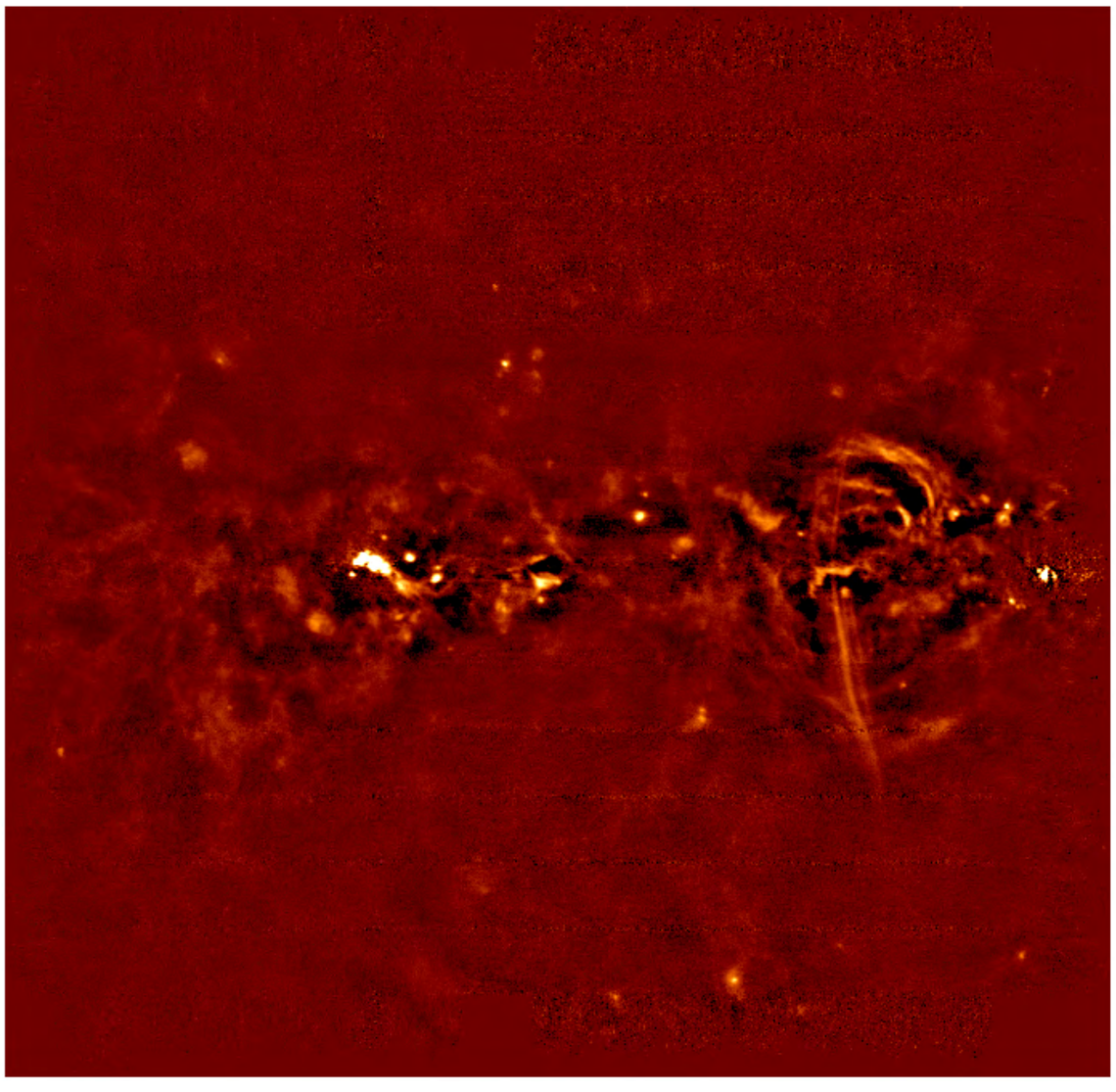
- Operation on sdfits data (after filling)
- OTF spectral line mapping
- Multi-pixel receivers, multi-lines

Not These Use Cases

MUSTANG2 Galactic Plane Survey

PI: Adam Ginsburg
Images courtesy of Brian Mason





Survey Software Roles

Data and Observing Management

Mapping connecting log data to output products

Calibration

Raw telescope data into astronomer units

Mapping

Individual spectra converted into data cubes

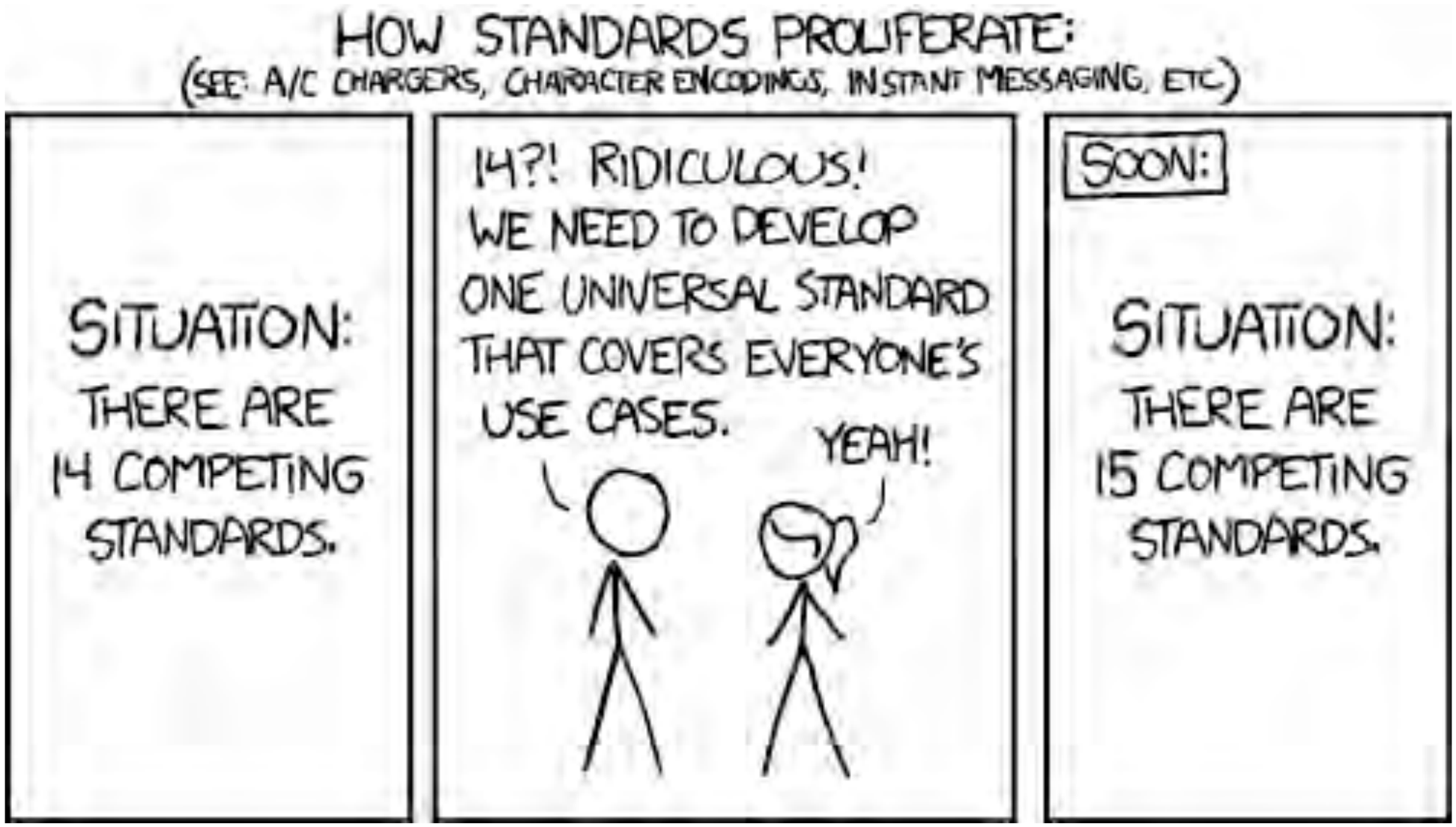
Analysis

Derived science projects.

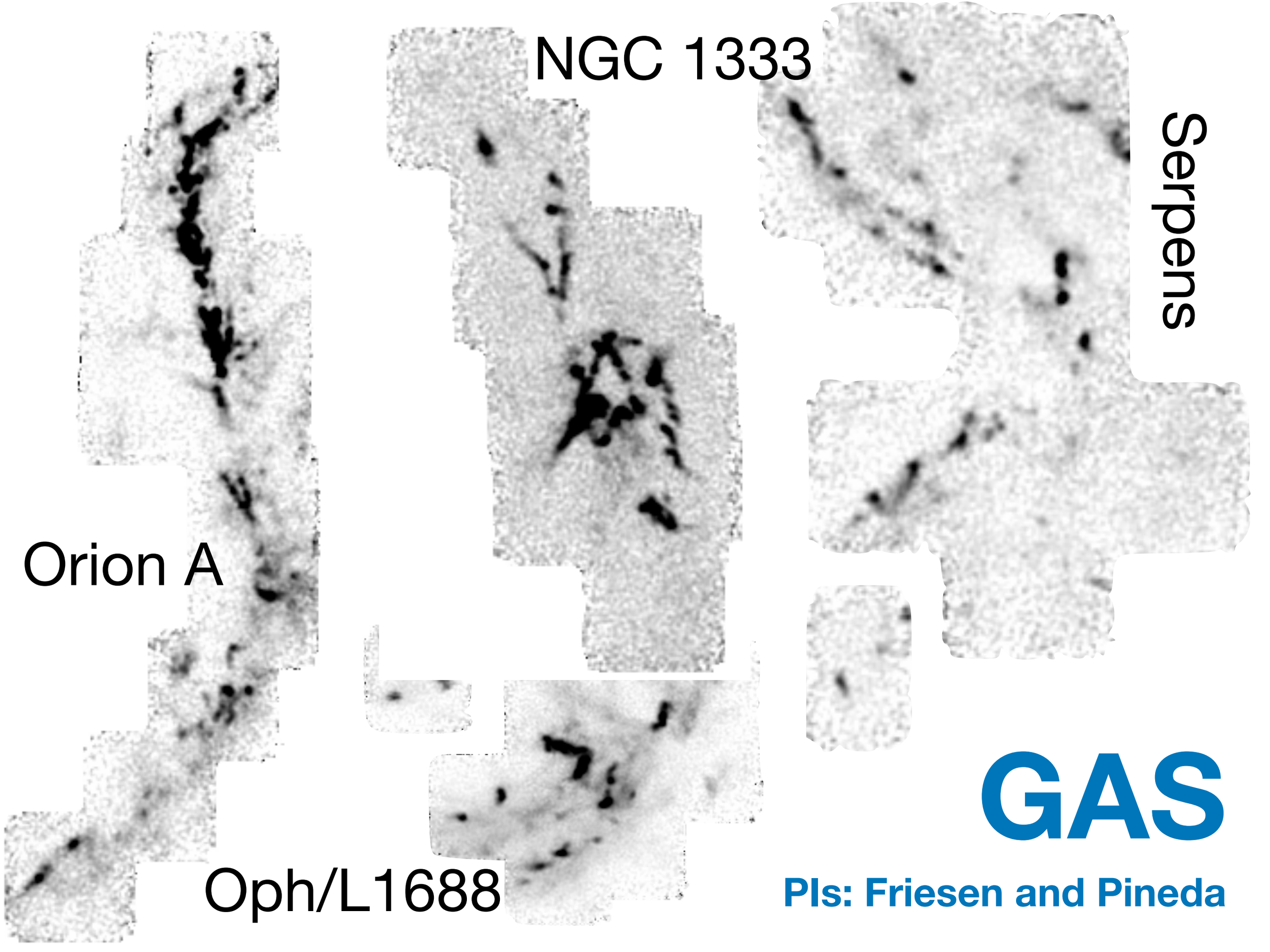
The Landscape

Calibration	GBTIDL, gbt-pipeline, user software (TMBIDL, Robishaw and Heiles, etc.)
Mapping	AIPS gridder, gbtgridder, cygrid, sdgrid (CASA)
Analysis	GBTIDL, pyspeckit, user software
Observation Management	Whatever you like

How we got here



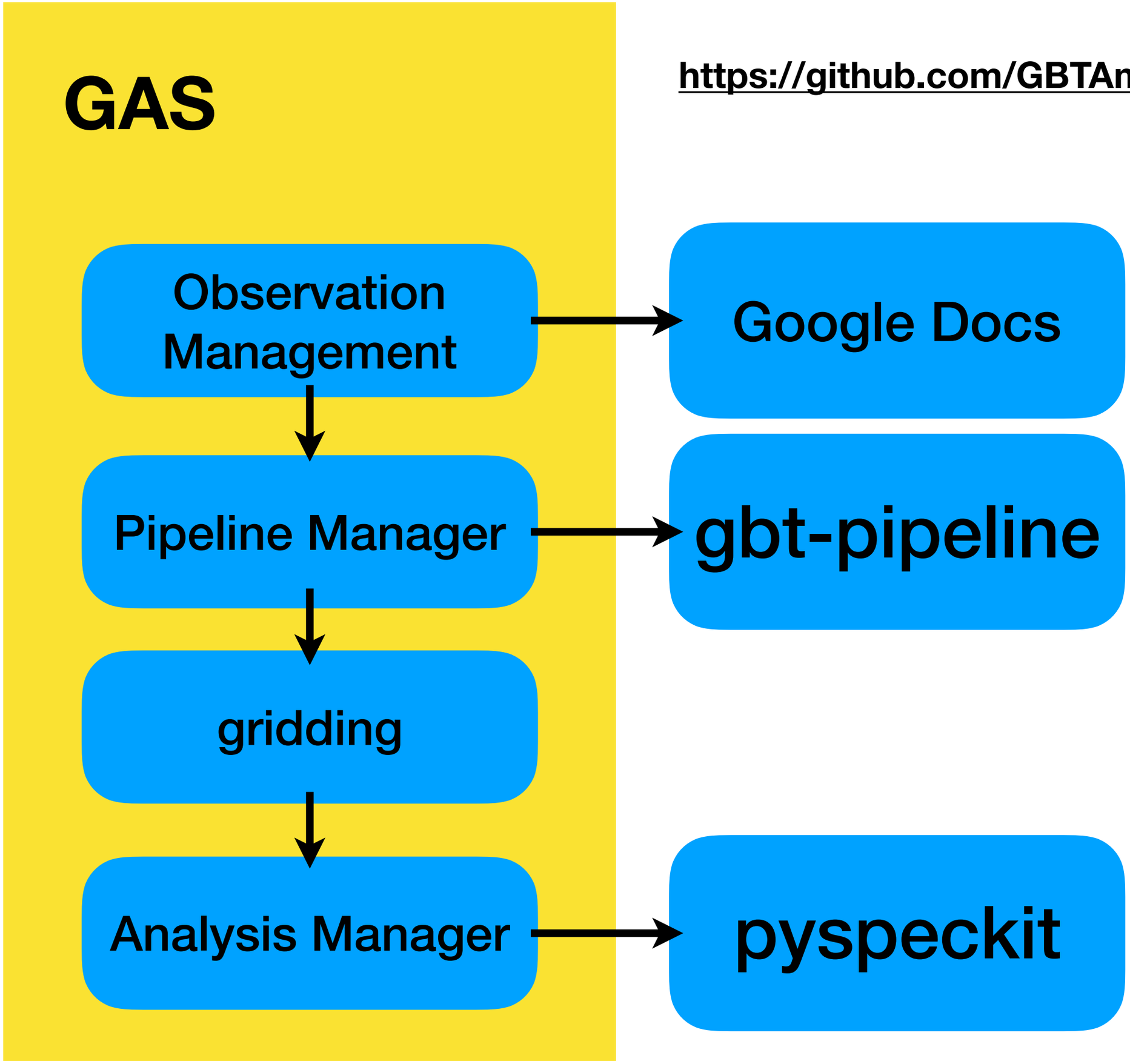
xkcd.com



GAS

PIs: Friesen and Pineda

https://github.com/GBTAmmoniaSurvey



Observing logs control pipeline

DEGAS Observing Logs

File Edit View Insert Format Data Tools Add-ons Help

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Project

	A	B	C	D	E	F	G	H
1	*Project*	Date (UT)	Astrid Session	Time (UT)	Source	Source Type	Scan Type	Setup
2	17A-304	2017-02-13	1	3:34	0319+4130	calibrator	AutoOOF	HCN/HCO+
3	17A-304	2017-02-13	1	3:57:01	0319+4130	calibrator	AutoOOF	HCN/HCO+
4	17A-304	2017-02-13	1	4:02	0319+4130	calibrator	PointFocus	HCN/HCO+
5	17A-304	2017-02-13	1	4:08	0319+4130	calibrator	Peak	HCN/HCO+
6	17A-304	2017-02-13	1	4:13	0319+4130	calibrator	Nod	HCN/HCO+

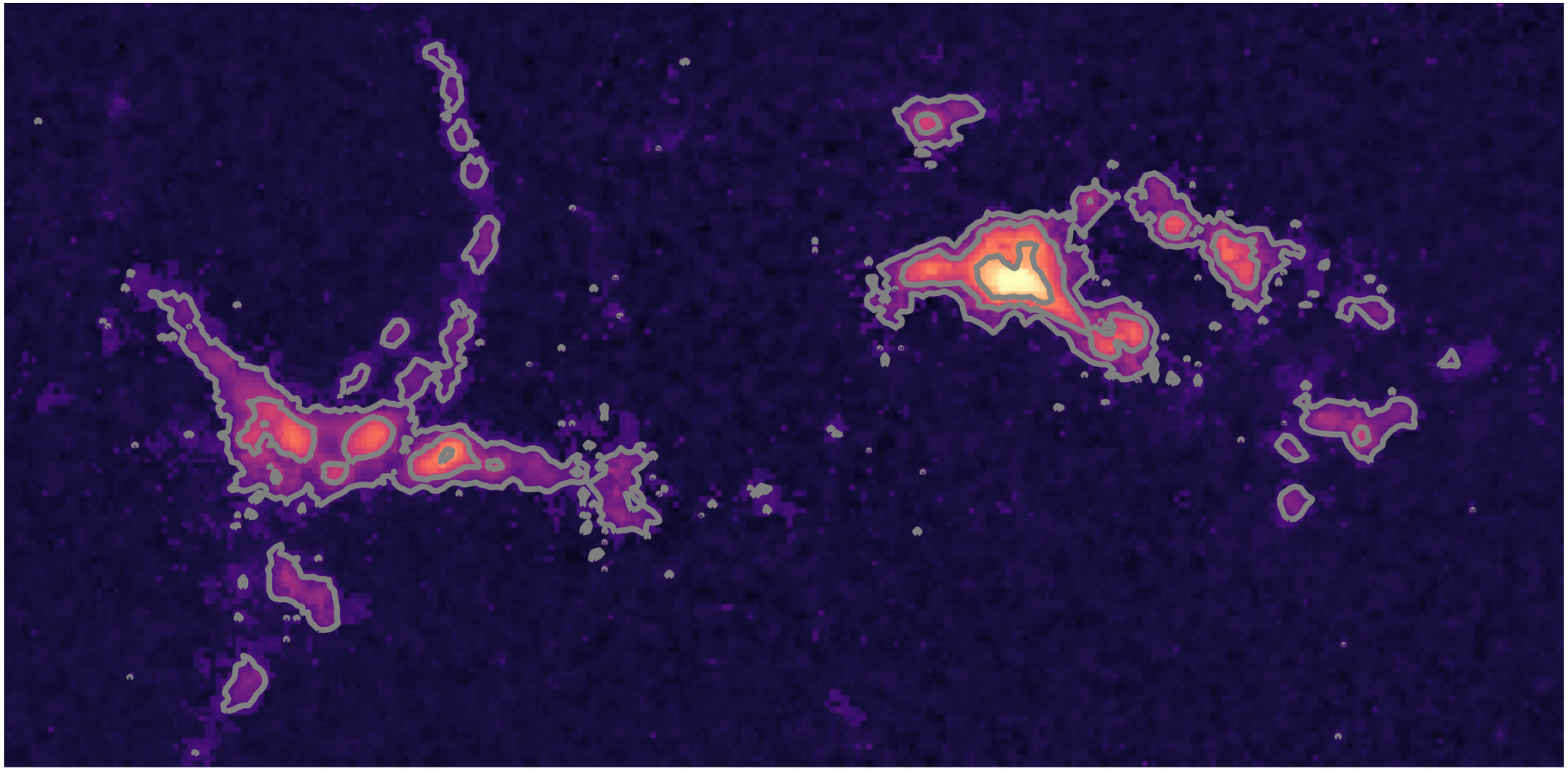
```
In [1]: import GAS
In [2]: GAS.updateLogs()
In [3]: GAS.reduceAll()
```

Pulls from Google Docs

Calibrates all new data

KEYSTONE

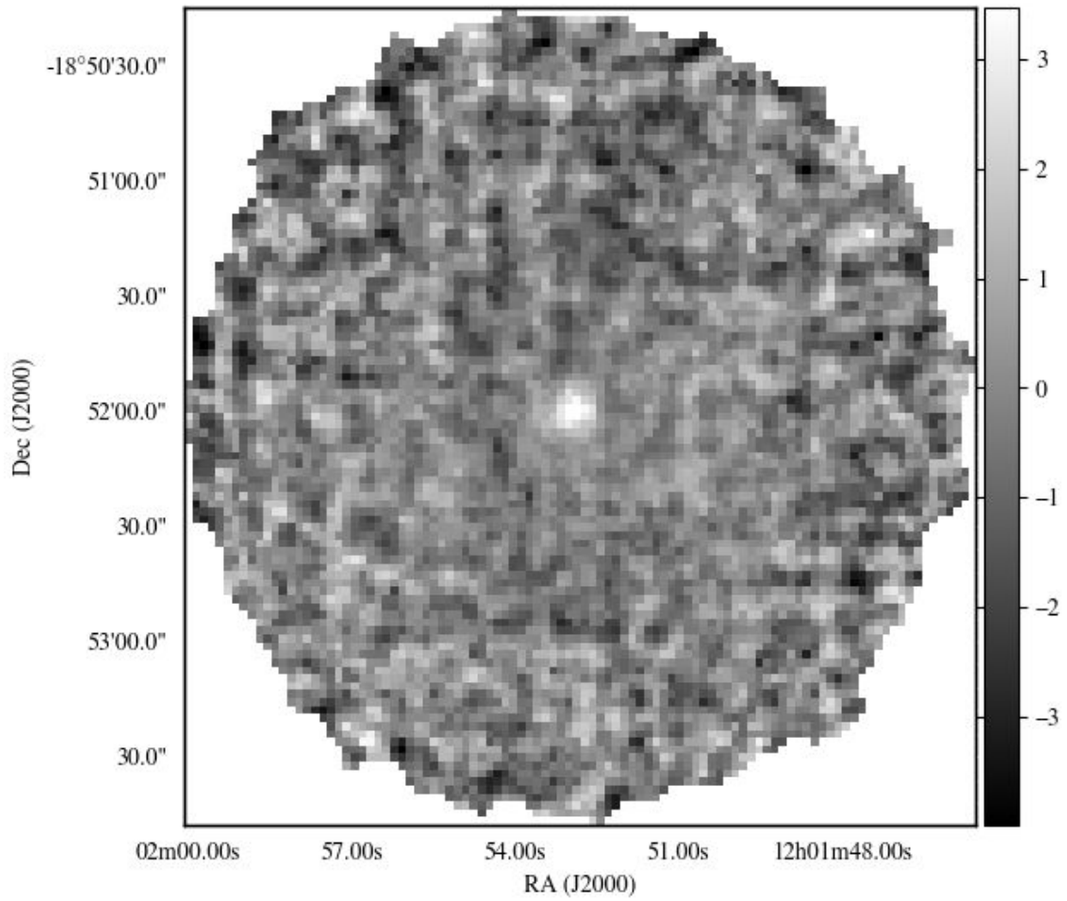
PI: James DiFrancesco



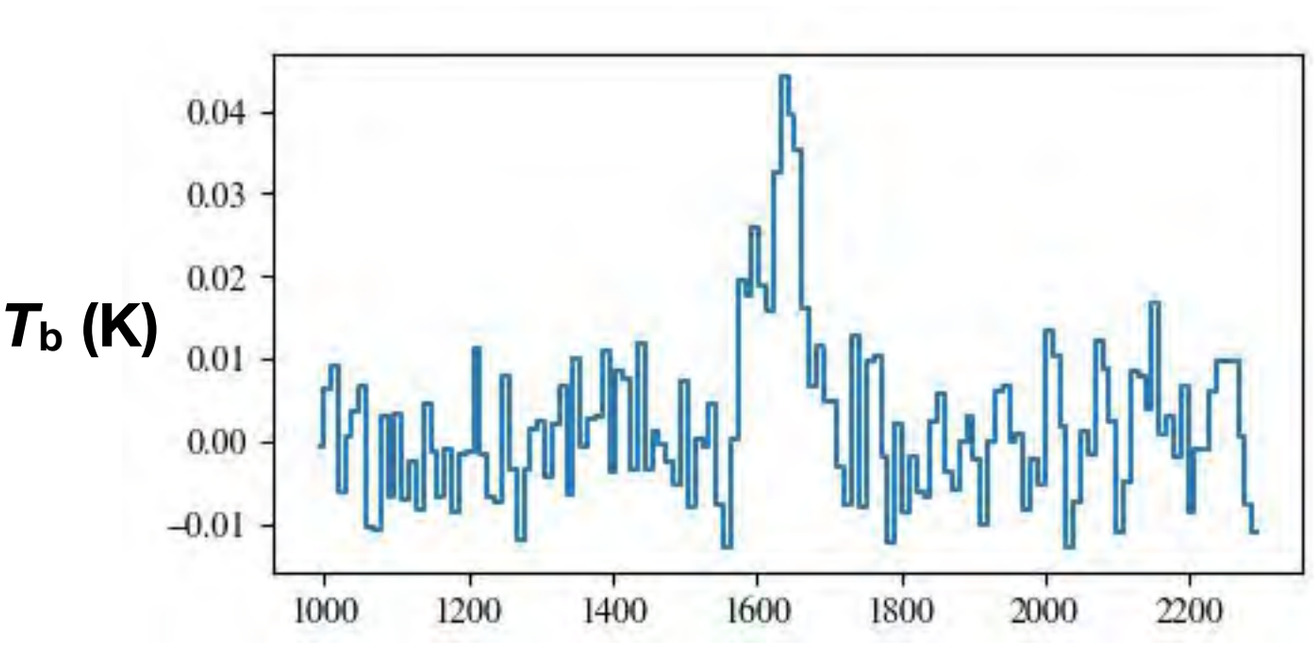
Similar mapping strategy
Different spectral setups (KEYSTONE uses RAMPS setup)

DEGAS

PI: Amanda Kepley



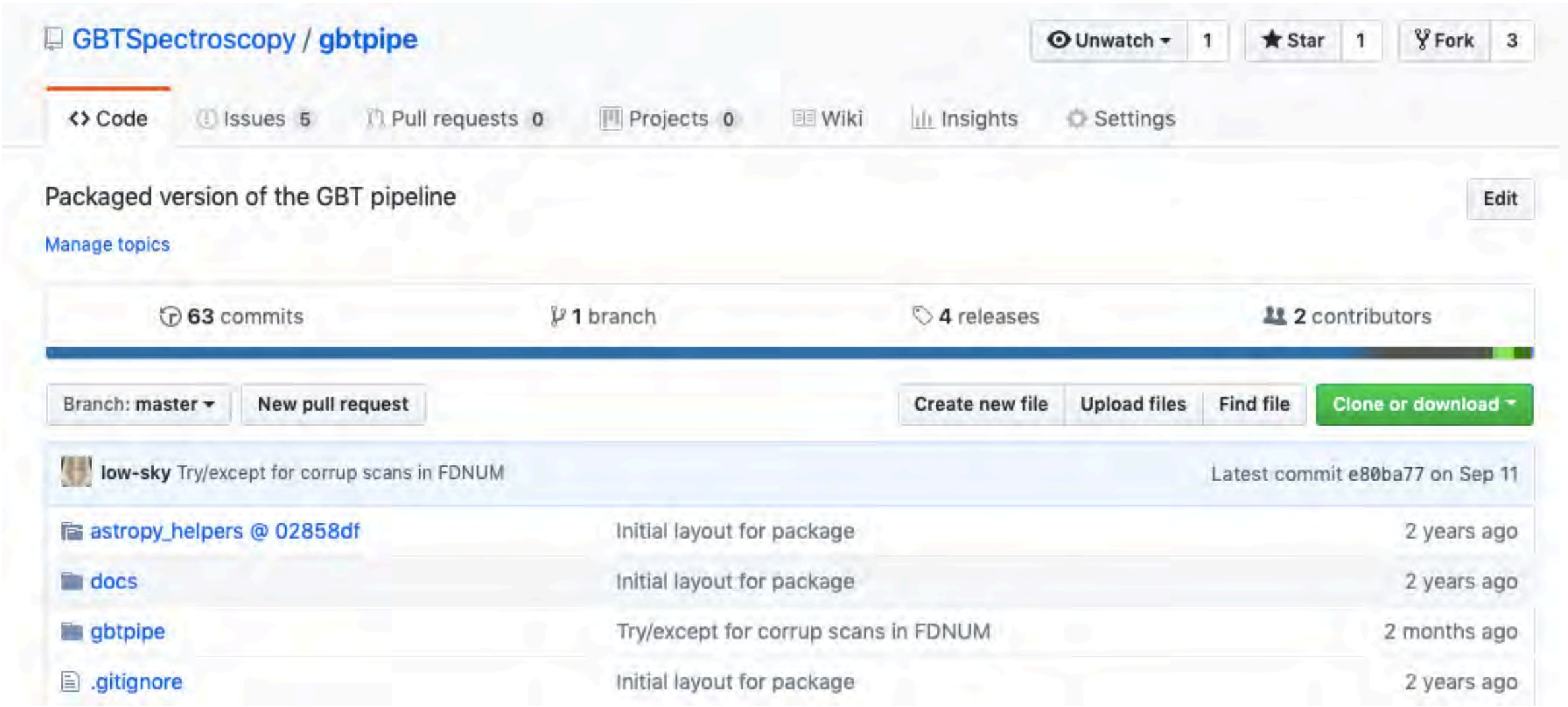
NGC 4038



New mapping strategy
New calibration data needed

gbtpipe

https://github.com/GBTSpectroscopy/gbtpipe



Provides interface to GBT calibration framework in python

Github model for pipeline managment

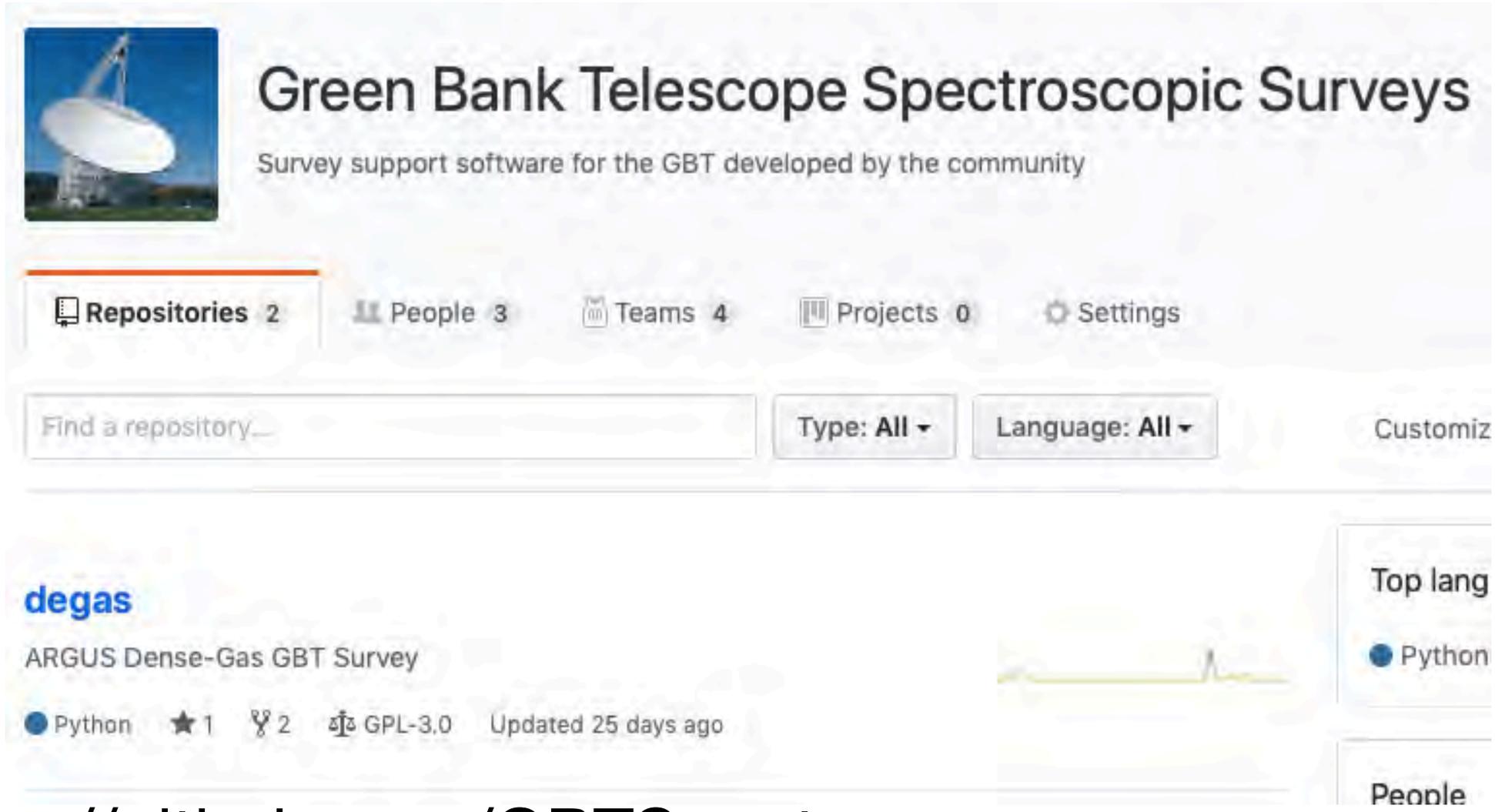
- Allow multiple contributors to the pipeline development via pull request model

- Data release
    - Build end-to-end script for making data products
    - Create tag in github
- Documentation and public release
- Possibility for regression testing

Areas for Partnerships

- **Web-based access to GBT weather data**
- Connections between software teams on different surveys
- Local storage and faster access to on site machines (X2GO rather than VNC)?

Community Development Partnerships

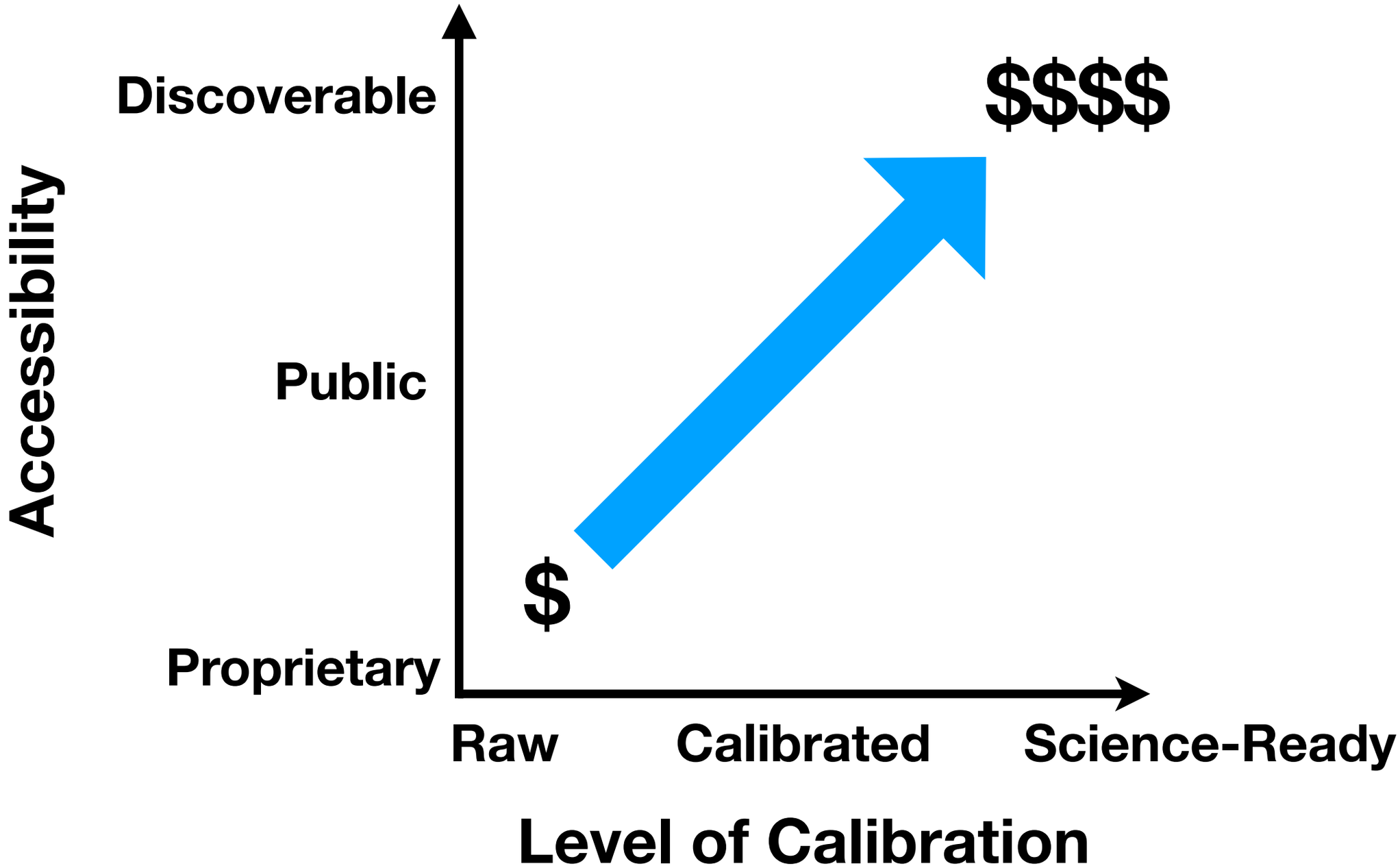


https://github.com/GBTSpectroscopy

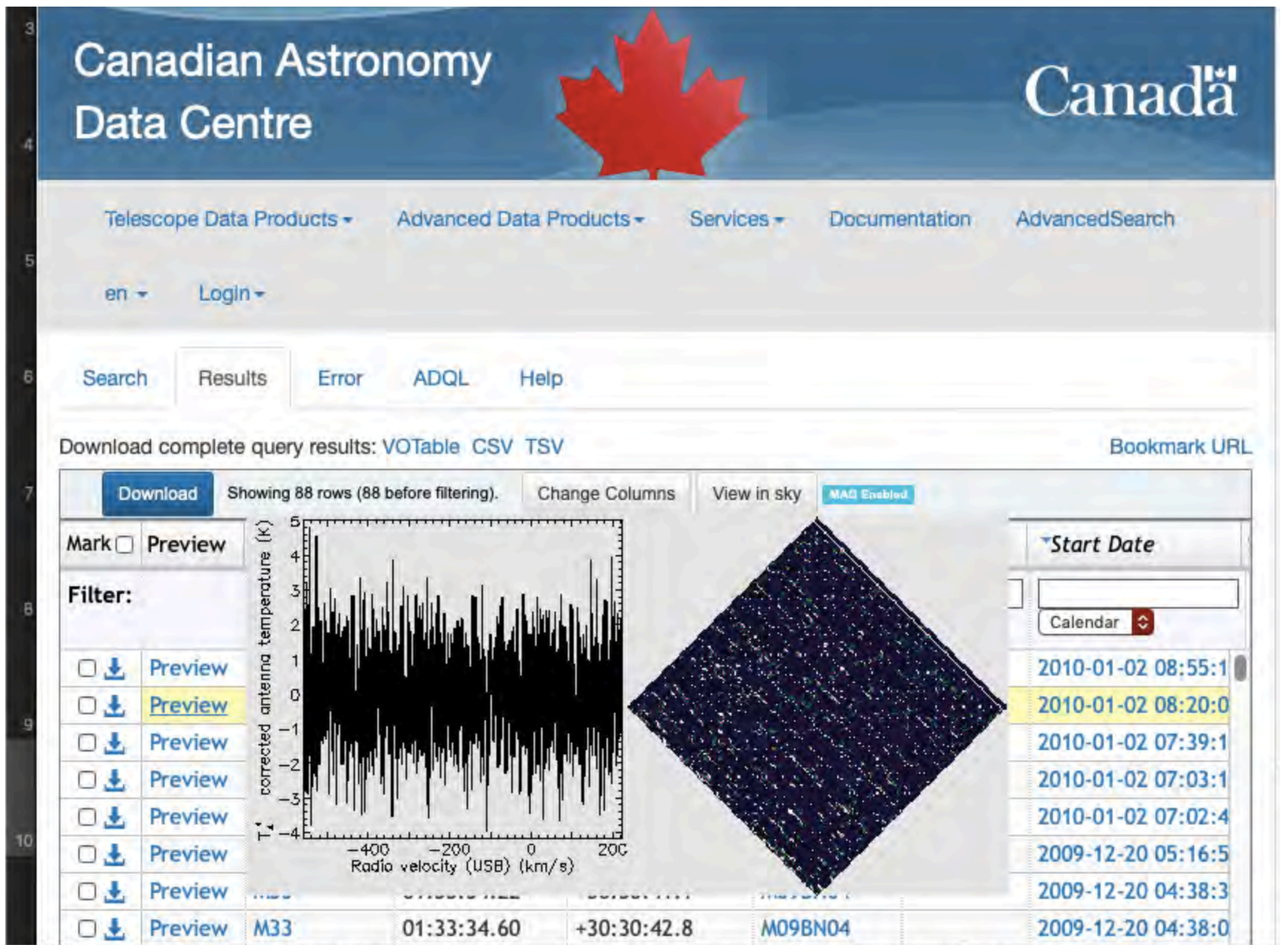
Stupid ideas: software bounties. Hack meetings. Community software manager

Data Access and SRDP

SRDP = Science-Ready Data Products



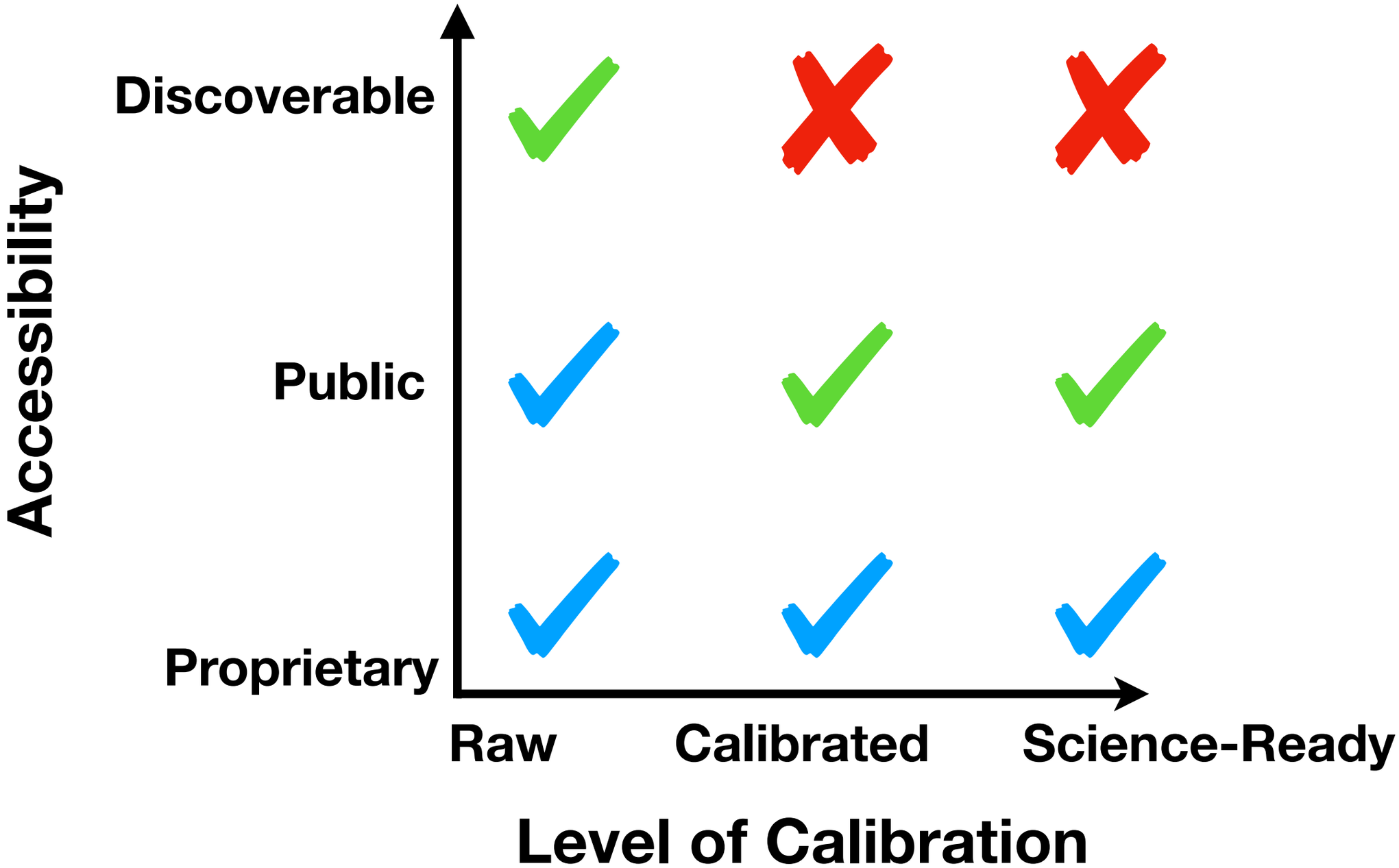
Discoverability — Ability to find a product without knowing that the survey exists.



This is hard. Useful but difficult.

Data Access and SRDP

SRDP = Science-Ready Data Products



Lessons Learned

- Efficiencies gained from parallel development across different surveys
- Excellent software exists in GBT legacy
- Access to individual software pieces allows rapid development of pipelines:
  - ON/OFF pairs
  - Logging
  - Weather
  - Spectroscopic transforms