Online tools for planetary sciences

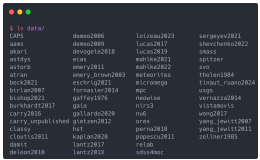
B. Carry[1] & **M. Mahlke**[2]
[1]Lagrange, Observatoire de la Côte d'Azur, Nice
[1]Institut d'Astrophysique Spatiale, Orsay

Databases and Data Aggregators

We all need data, we all generate data.

- **Databases**
  - Websites, CDS, on request
  - Mostly static, single bibliographic reference
  - Mixture of formats

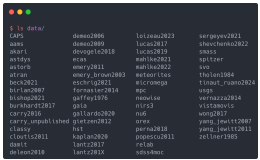
Databases and Data Aggregators



We all need data, we all generate data.

- **Databases**
  - Websites, CDS, on request
  - Mostly static, single bibliographic reference
  - Mixture of formats
- **Data Aggregators**
  - Collection of data with processing
  - Dynamic, large number of bibliography references
  - Uniform output

Databases and Data Aggregators



We all need data, we all generate data.

- **Databases**
  - Websites, CDS, on request
  - Mostly static, single bibliographic reference
  - Mixture of formats
- **Data Aggregators**
  - Collection of data with processing
  - Dynamic, large number of bibliography references
  - Uniform output

Data aggregation takes effort but saves time and energy.

Data Aggregators

Name	Objects	Parameters	URL
ECOCEL	Asteroids	Physical, Orbital	http://www.ecocel-database.com/
JPL SBDB	Asteroids, Comets	Physical, Orbital	https://ssd.jpl.nasa.gov/tools/sbdb_lookup.html
Lowell	Asteroids	Physical, Orbital	https://asteroid.lowell.edu/astinfo/
MP3C	Asteroids	Physical, Orbital	https://mp3c.oca.eu/
NEOExchange	Near-Earth Objects	Orbital	https://neoexchange.lco.global/
SiMDA	Asteroids, Comets	Size, Mass, Density	https://astro.kretlow.de/simda/
SsODNet	Asteroids	Physical, Orbital	https://ssp.imcce.fr/forms/ssocard

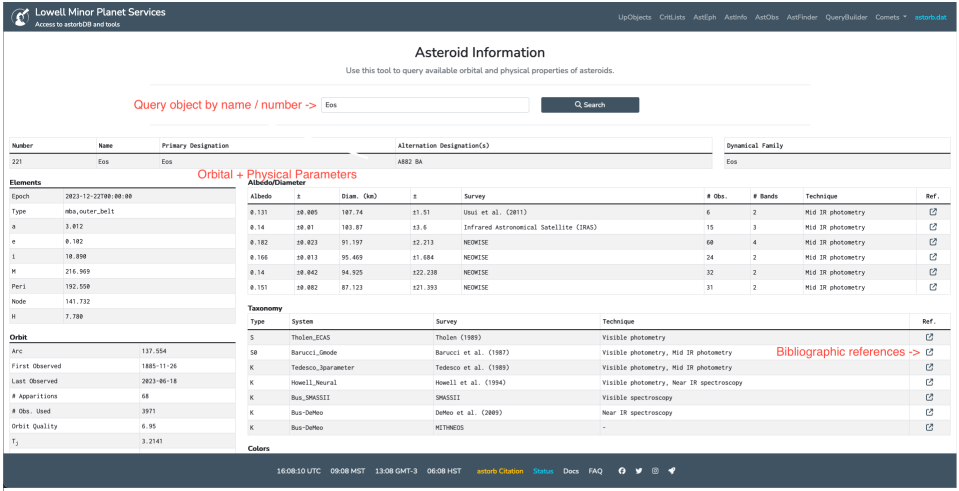
Data Aggregators

Name	Objects	Parameters	URL
ECOCEL	Asteroids	Physical, Orbital	http://www.ecocel-database.com/
JPL SBDB	Asteroids, Comets	Physical, Orbital	https://ssd.jpl.nasa.gov/tools/sbdb_lookup.html
Lowell	Asteroids	Physical, Orbital	https://asteroid.lowell.edu/astinfo/
MP3C	Asteroids	Physical, Orbital	https://mp3c.oca.eu/
NEOExchange	Near-Earth Objects	Orbital	https://neoexchange.lco.global/
SiMDA	Asteroids, Comets	Size, Mass, Density	https://astro.kretlow.de/simda/
SsODNet	Asteroids	Physical, Orbital	https://ssp.imcce.fr/forms/ssocard

Demo

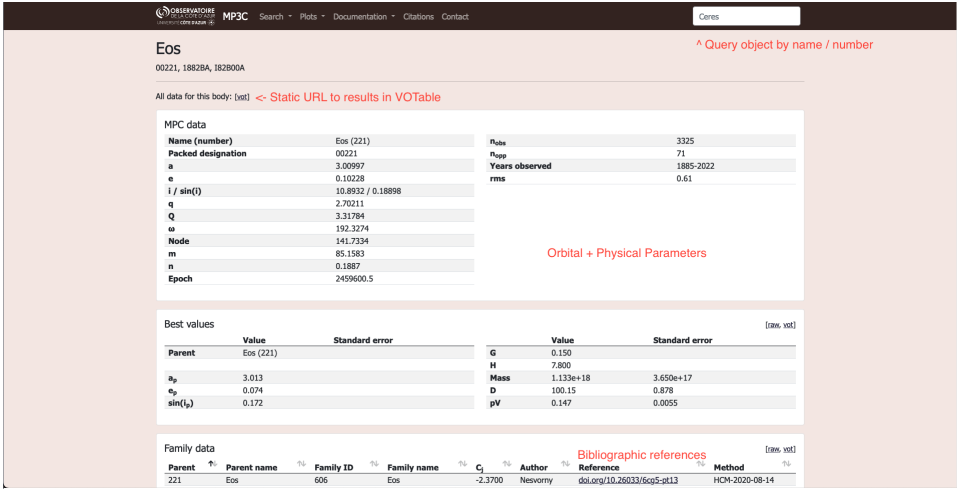
The next slides show an outline of the demoed material.

Demo



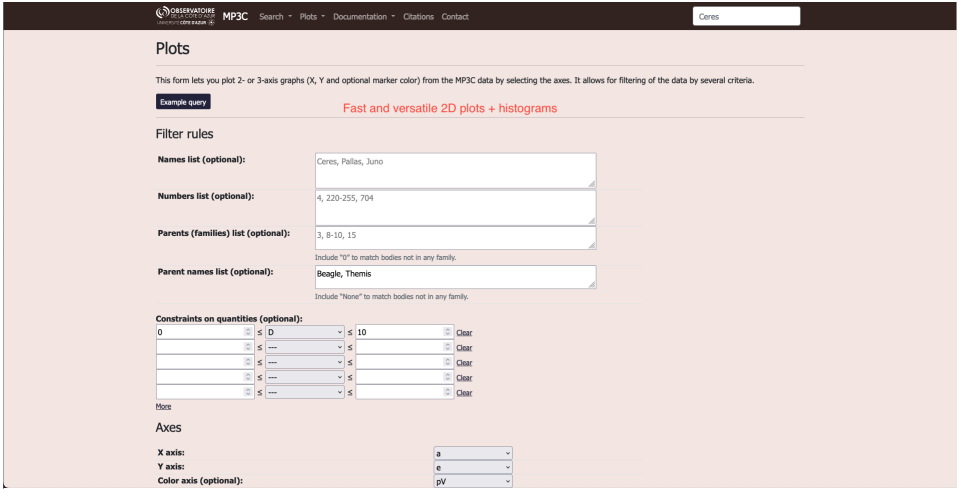
https://asteroid.lowell.edu/

Demo



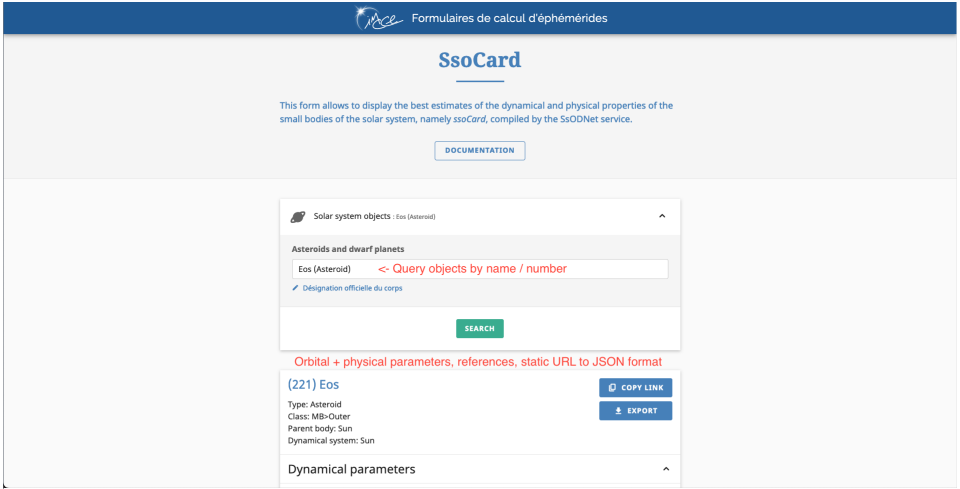
https://mp3c.oca.eu/

Demo



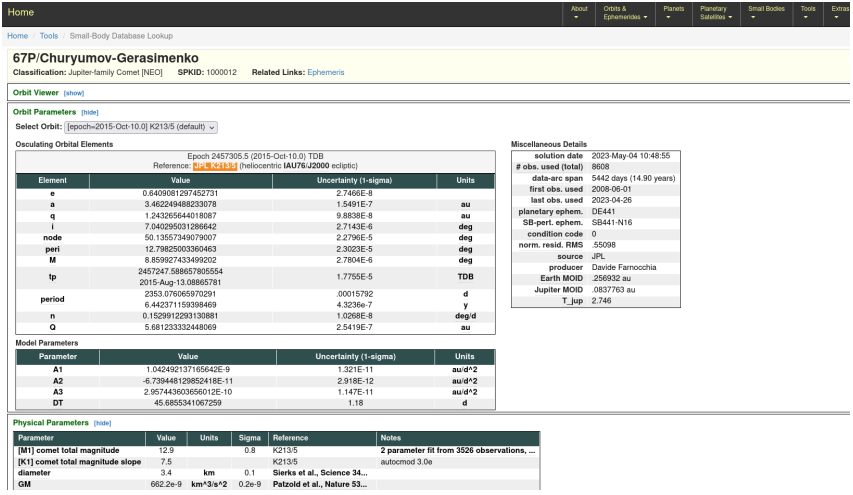
https://mp3c.oca.eu/xyc-plot/

Demo



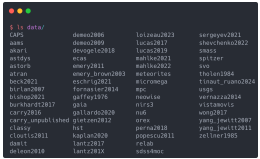
https://ssp.imcce.fr/forms/ssocard

Demo



https://ssd.jpl.nasa.gov/tools/sbdb_lookup.html

The N-Body Problem



Lowell Minor Planet Services
Access to astorbDB and tools

OBSERVATOIRE DE LA CÔTE D'AZUR
UNIVERSITÉ CÔTE D'AZUR
MP3C

IMCCE webservices

- **Graphical User Interfaces do not scale**
  - Many bodies → Many clicks
  - Repeated queries to update data
  - Bibliography management

→ Data aggregators need programmatic APIs

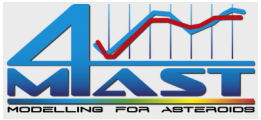
- **Different degrees of simplification**
  - Static URLs pointing to text files
  - Common service such as the *Table Access Protocol*
  - Secondary client such as `python` packages

Tutorial

[20min] Tutorial notebook on data access

- Basic: Programmatic data access with `astroquery` and `rocks`
- Advanced: Analysis of catalogue data with `rocks`
- Expert: Building our own meteorite-classification lookup tool

Spectra Access



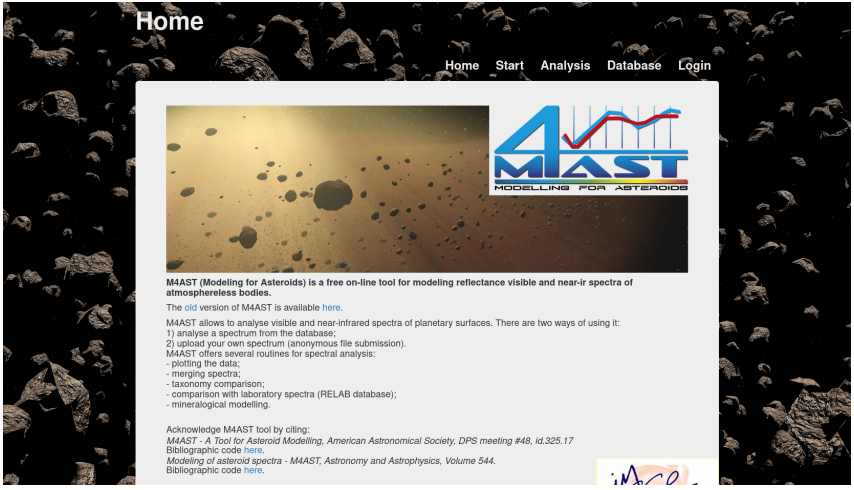
classy

- **Spectra are complex data products**
  - Wavelength, Reflectance, Irradiance, ...
  - Instrument Metadata
  - Sample Metadata
- **Spectra Databases for Ast./Comets/Met.**
  - PDS, CDS, RELAB
  - SMASS, MITHNEOS
- **Spectra Aggregators for Asteroids and Meteorites**
  - SSHADE, M4AST, `classy`
  - Processing required
  - Few updates

Demo

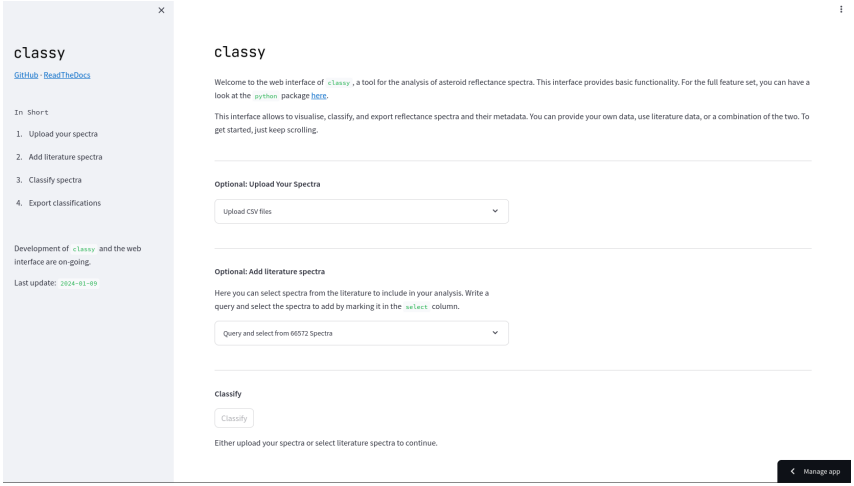
The next slides show an outline of the demoed material.

M4AST



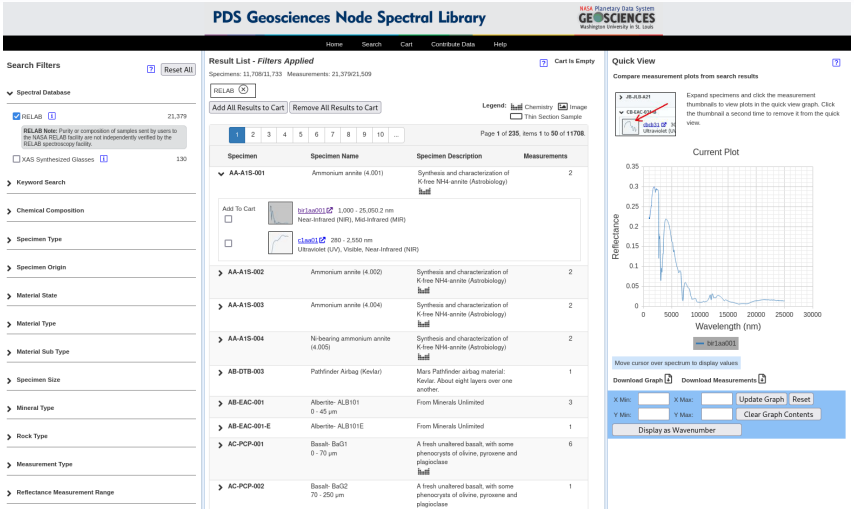
https://spectre.imcce.fr/m4ast/index.php/index/home

classy



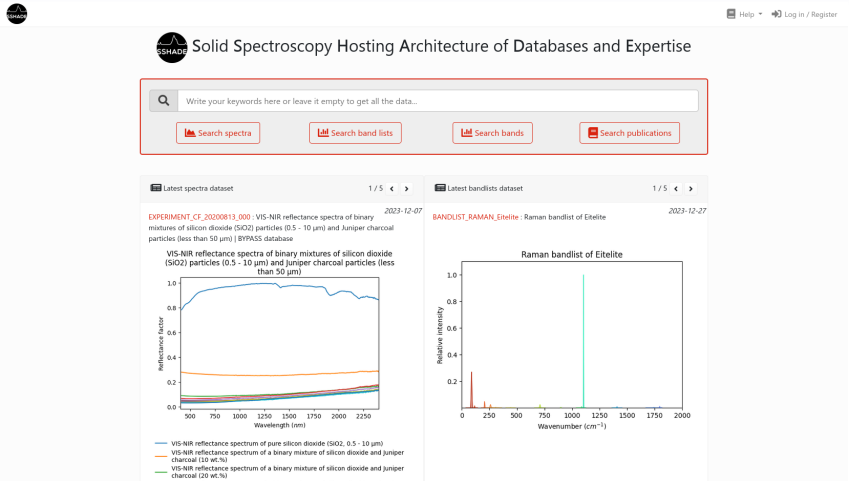
https://classy.streamlit.app/

RELAB



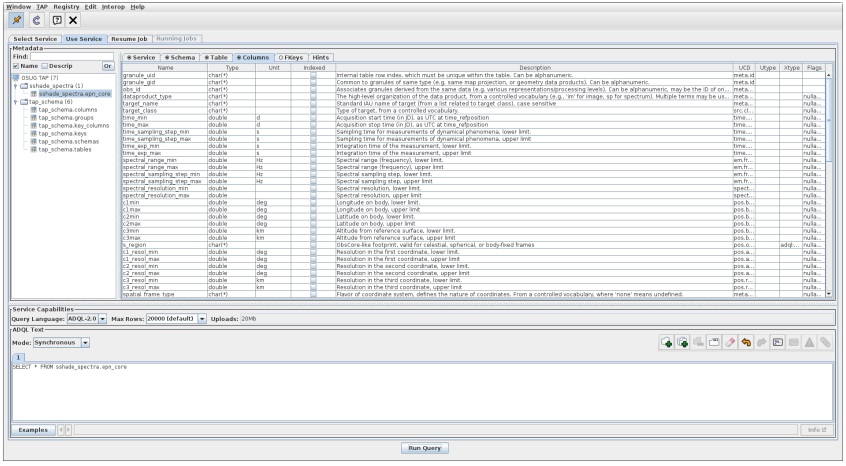
https://sites.brown.edu/relab/relab-spectral-database/

SSHADE



https://www.sshade.eu

SSHADE



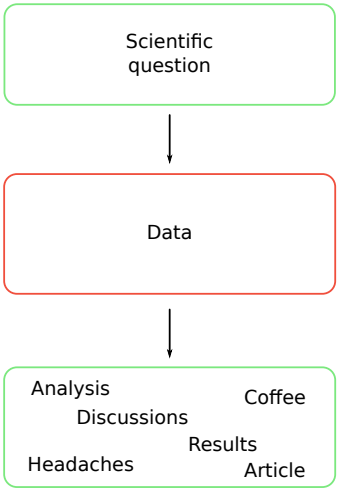
TOPCAT → TAP Query → “SSHADE”

Tutorial

[20min] Tutorial notebook on spectra access with SSHADE and TAP

- Basic: Access of SSHADE database using TAP
- Advanced: Creating an `astroquery` module for SSHADE

Re: A typical research project



Repetitive (and tedious) tasks!

- **Planning and conduction of observations**
  - Observations already exist?
  - Target/sample available? visible?
- **Gathering ancillary data for the analysis**
  - Complementary information diameter, fall/find, ...
  - Context for research another population
- **Repetitive low-level analysis**
  - Spectral classification
  - Cross-matches & merges

Online resources in a nutshell

- A suite of pages, libraries, and services
  - **Providers:** data archives, catalogs, online codes
  - **Clients:** GUI, CLI, analysis tools
  - Check IVOA: `http://ivoa.net/astronomers/applications.html`

Online resources in a nutshell

- A suite of pages, libraries, and services
  - **Providers:** data archives, catalogs, online codes
  - **Clients:** GUI, CLI, analysis tools
  - Check IVOA: `http://ivoa.net/astronomers/applications.html`

- Mostly following a couple of standards
  - Common interface I/O: VOTable, json, Protocols: TAP, cone-search
  - Registries → phone book
  - Homogeneisation of interface in APIs and in python modules

Online resources in a nutshell

- A suite of pages, libraries, and services
  - **Providers:** data archives, catalogs, online codes
  - **Clients:** GUI, CLI, analysis tools
  - Check IVOA: `http://ivoa.net/astronomers/applications.html`

- Mostly following a couple of standards
  - Common interface I/O: VOTable, json, Protocols: TAP, cone-search
  - Registries → phone book
  - Homogeneisation of interface in APIs and in python modules

- It is **not** a master software

Online resources in a nutshell

- A suite of pages, libraries, and services
  - **Providers:** data archives, catalogs, online codes
  - **Clients:** GUI, CLI, analysis tools
  - Check IVOA: `http://ivoa.net/astronomers/applications.html`
- Mostly following a couple of standards
  - Common interface I/O: VOTable, json, Protocols: TAP, cone-search
  - Registries → phone book
  - Homogeneisation of interface in APIs and in python modules
- It is **not** a master software
- Resources are made **by** us, and **for** us
  - Powerful libraries and tools
  - Good practice to release data/codes Consider CDS at the very least
  - Contribute to open-source projects: `astroquery`, `sbpy`, `rocks`, ...