

IVOA InterOp, Tucson, November 2023

SsODNet

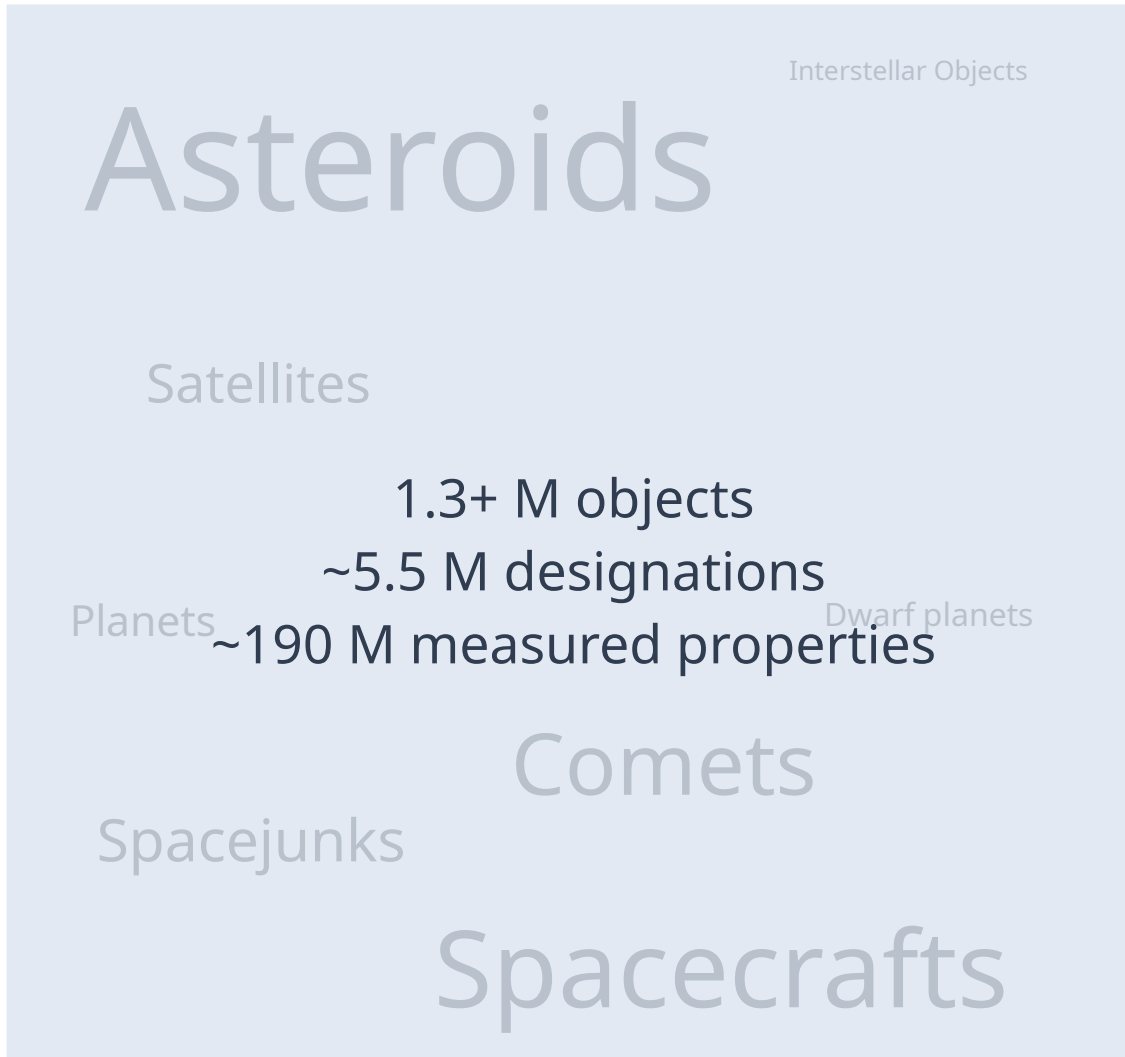
Solar system Open Database Network

REST API for advanced data queries

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Context



- Public catalogs (PDS, CDS)
- Alternative repositories
- 3000+ Articles
- Different designations according to catalogs or articles



SsODNet in a nutshell

- A massive source of information
 - ~1.3 M Solar system objects
 - ~5.5 M designations
 - ~190 M measurements
 - 3000+ articles
- With dedicated datasets and APIs
 - **quaero**: name resolution
 - **datacloud**: all the data
 - **ssoCard**: best estimates only
 - **ssoBFT**: all ssoCards at once
- Open access to everyone
 - **Webform**: <https://ssp.imcce.fr/forms/ssocard>
 - **rocks python client**: <https://rocks.readthedocs.io/en/latest/>
 - **APIs**: <https://ssp.imcce.fr/webservices/>

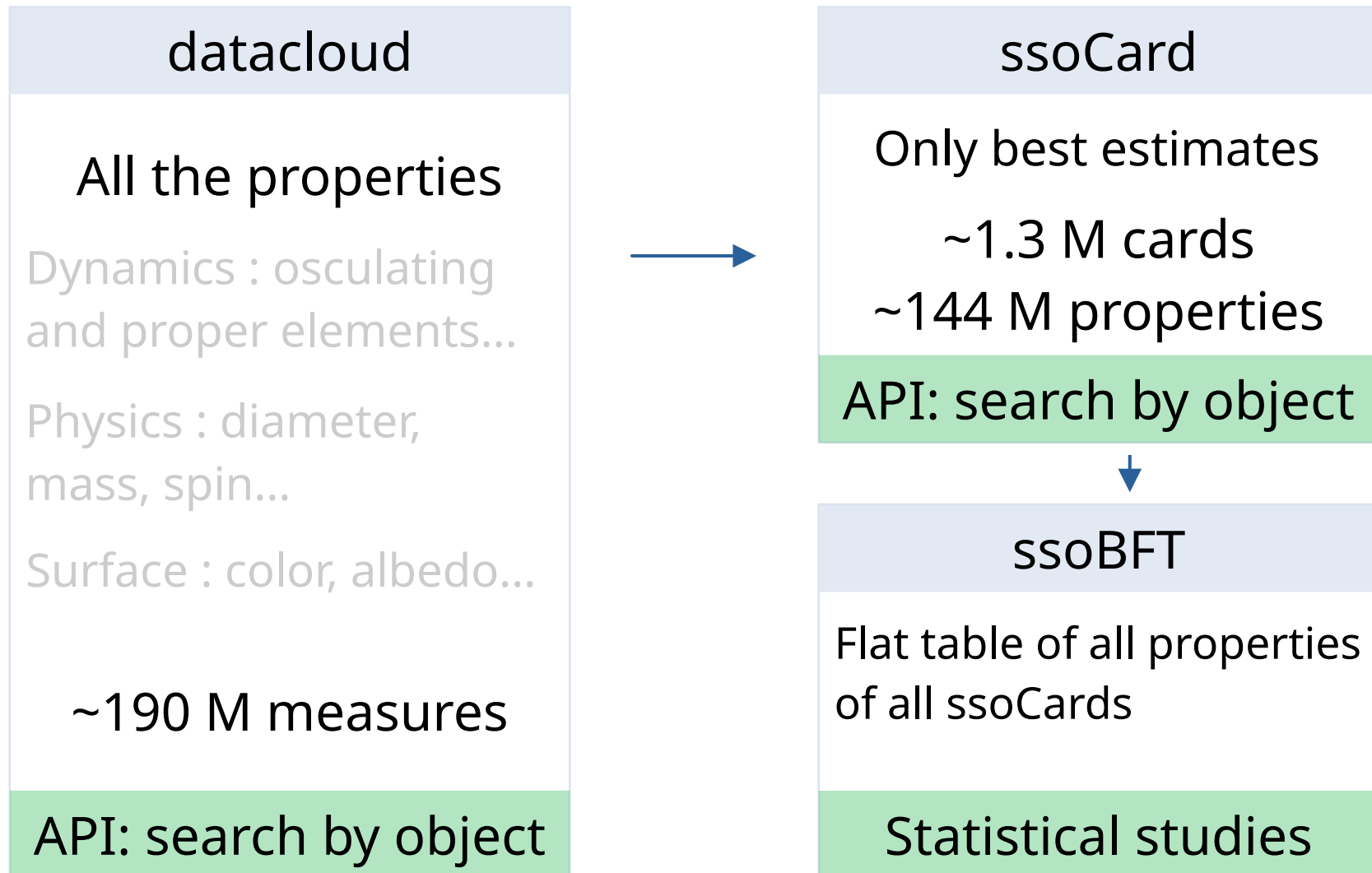
The image shows two overlapping windows. The left window is a terminal with a table of data for Ceres. The right window is a web browser showing the ssoCard for Ceres.

	mass	err_mass_up	err_mass_down	method	shortbib
1	9.3483e+20	5.967e+19	-5.967e+19	DEFLECT	Grff11n1001
2	9.55e+20	4.38e+19	-4.38e+19	DEFLECT	
3	9.54e+20	1.69e+19	-1.69e+19	DEFLECT	
4	9.94e+20	3.98e+19	-3.98e+19	DEFLECT	
5	9.19e+20	1.41e+19	-1.41e+19	DEFLECT	
6	8.27e+20	3.78e+19	-3.78e+19	DEFLECT	
7	9.29e+20	1.79e+19	-1.79e+19	DEFLECT	
8	9.52e+20	7.76e+18	-7.76e+18	DEFLECT	
9	9.47e+20	4.57e+18	-4.57e+18	DEFLECT	
10	8.73e+20	7.96e+18	-7.96e+18	DEFLECT	
11	9.35e+20	7.96e+18	-7.96e+18	DEFLECT	
12	9.35e+20	5.97e+19	-5.97e+19	DEFLECT	
13	9.57e+20	1.99e+18	-1.99e+18	DEFLECT	
14	9.45e+20	3.98e+18	-3.98e+18	DEFLECT	
15	9.45e+20	4.18e+18	-4.18e+18	EPHEM	
16	9.35e+20	5.57e+18	-5.57e+18	DEFLECT	
17	9.42e+20	5.17e+18	-5.17e+18	DEFLECT	
18	9.46e+20	7.96e+17	-7.96e+17	EPHEM	
19	9.45e+20	5.97e+18	-5.97e+18	DEFLECT	
20	9.32e+20	9.32e+19	-9.32e+19	EPHEM	
21	9.39e+20	5.97e+18	-5.97e+18	EPHEM	
22	9.46e+20	1.43e+18	-1.43e+18	DEFLECT	
23	9.52e+20	4.63e+18	-4.63e+18	DEFLECT	
24	9.46366e+20	5.5692e+18	-5.5692e+18	EPHEM	
25	9.4e+20	3.1e+18	-3.1e+18	DEFLECT	
26	9.42e+20	2.65e+18	-2.65e+18	DEFLECT	
27	9.42e+20	2.68e+18	-2.68e+18	DEFLECT	
28	9.31e+20	6.46e+18	-6.46e+18	EPHEM	
29	9.64e+20	1.39e+19	-1.39e+19	DEFLECT	
30	9.29e+20	3.68e+18	-3.68e+18	EPHEM	
31	9.41e+20	5.69e+18	-5.69e+18	EPHEM	
32	9.38e+20	1.57e+18	-1.57e+18	EPHEM	
33	9.40757e+20	0.0	0.0	EPHEM	
34	9.44e+20	5.97e+17	-5.97e+17	DEFLECT	
35	9.29e+20	3.84e+18	-3.84e+18	EPHEM	
36	9.384e+20	1e+17	-1e+17	SPACE	
37	9.384e+20	1.312e+18	-1.312e+18	EPHEM	
38	9.38e+20	2.21e+18	-2.21e+18	EPHEM	
39	9.38340e+20	2.28689e+18	-2.28689e+18	EPHEM	
40	9.39e+20	2.31e+18	-2.31e+18	EPHEM	

The web browser window shows the ssoCard for Ceres, displaying various parameters such as Type (Dwarf Planet), Class (MB>Middle), Parent body (Sun), Dynamical system (Sun), Dynamical parameters, Physical parameters (Absolute magnitude, Diameter, Albedo, Mass, Density), Taxonomy (Class = C, Complex = C, Wavelength range = VISNIR, Scheme = Mahlike), Thermal inertia, and Spins (Period type = Sidereal, Period flag = 3).



SsODNet datasets and APIs



API - Advanced search

- Early stage of development
- Aims
 - Search for objects with criteria on properties
 - Use easy and flexible syntax
 - Handle range queries and compound queries

```
?q=i:(>=4.6 AND <=4.65) AND p_v:[0.25 TO 0.26]
```



API - Overview

- REST architecture
- Standards HTTP verbs and codes
- JSON representation
- Pagination
- Web Linking
- CORS enabled
- Elasticsearch / Lucene



API – ssoCard resource

- JSON document
 - List of property:value pairs
 - Up to 680 properties. Most are not available.
- Why JSON
 - Face heterogeneous data (planet ≠ comet ≠ asteroid)
 - Use of nested properties
 - Skip unavailable properties
 - Keep filesize small (~7kiB ± 4kiB)
 - Metadata available in dedicated file
- 64 queryable properties

```
{
  "id": "Eminescu",
  "name": "Eminescu",
  "type": "Asteroid",
  ...
  "parameters": {
    "dynamical": {
      "orbital_elements": {
        "inclination": {
          "value": 4.644535,
          "error": {
            "min": -0.001,
            "max": 0.001
          }
        }
      }
    },
    ...
  },
  ...
  "physical": {
    "albedo": {
      "value": 0.2502,
      "error": {
        "min": -0.0485,
        "max": 0.0485
      }
    },
    "bibref": [{
      "shortbib": "Berthier+2023",
      "title": "SsODNet: Solar system Open Database Network",
      "year": 2022,
      "bibcode": "2023A&A...671A.151B",
      "doi": "10.1051/0004-6361/202244878"
    }],
    ...
  },
  "links": {
    "metadata": "https://ssp.imcce.fr/data/metadata_aster.json"
  }
}
```



API - Examples

- Get all objects of Vesta family

`?q=family:Vesta`

⇒ More than 10000 objects and it took 11ms

- Search objects with inclination and albedo in given ranges

`?q=i:(>=4.6 AND <=4.65) AND p_v:[0.25 TO 0.26]`

⇒ 11 objects in 9ms



API – Endpoint and methods

Endpoint

<https://api.ssodnet-dev.imcce.fr/dev/1/adv>

Advanced search

GET ?q={query}

Lucene query syntax

Get queryable properties

OPTIONS



What's next

- Aiming at completeness
 - Continuous addition of data
 - Expand the set of properties
 - Add properties for planets, satellites and comets
- Finalize and release the advanced search API
 - Expected 2024



Online resources

- SsODNet documentation (APIs...)

<https://ssp.imcce.fr/webservices/ssodnet/>

- Bibliographic reference

<https://ui.adsabs.harvard.edu/abs/2023A%26A...671A.151B>

- Mailing list

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