

This guide describes the public API for the Outer Planets Unified Search (OPUS) tool of the PDS Ring-Moon Systems Node. It was produced on 26-September-2020 and covers OPUS version 3.09.05.

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1. Basic Concepts: Metadata Fields, Retrieving, and Searching

1.1. API Format

The OPUS API is accessed by encoding requests in individual URLs passed to the OPUS server (normally <https://opus.pds-rings.seti.org>). Each request is independent and no state is saved between requests. A URL consists of the prefix components `/opus/api/` followed by the API entry point desired. The entry point name is suffixed by the desired format of the returned data (see [Return Formats](#)). API calls may take parameters provided after a single `?`. Each parameter is of the form `<name>=<value>`. If there is more than one parameter, they are separated by `&`. Parameters may be encoded using the standard octet encoding detailed in [RFC3986](#), although only `&`, `=`, and `+` are required to be encoded as octets if used as a parameter's value. Spaces in search values may also be encoded as `+`.

Examples:

- API call with no parameters:

https://opus.pds-rings.seti.org/opus/api/meta/result_count.json

- API call with one parameter:

https://opus.pds-rings.seti.org/opus/api/meta/result_count.json?volumeid=COISS_2001

- API call with two parameters:

https://opus.pds-rings.seti.org/opus/api/meta/result_count.json?time1=2009-01-01&time2=2010-01-01

1.2. The OPUS Database

The OPUS database contains a set of *observations*. Each observation is identified by a unique *OPUS ID*, which is a short series of characters identifying the mission, instrument, and observation number; the exact format of the OPUS ID varies by mission and instrument (e.g. Cassini ISS: `co-iss-w1294561143`, HST WFPC2: `hst-05392-wfpc2-u2930301t`). OPUS IDs can also be used to represent derived or composite products. Each observation is associated with metadata in one or more categories (e.g. "General" or "Ring Geometry"), each of which contains a series of metadata fields. Each metadata field is identified by a *fieldid*, which is a human-readable abbreviation. The list of available categories, metadata fields, and associated information is available [here](#) or through the API calls [api/categories.json](#), [api/categories/{opusid}.json](#), [api/fields.{fmt}](#), and [api/fields/{field}.{fmt}](#).

There are three basic types of fields stored in the database: *multiple-choice*, *string*, and *range*.

- **Multiple-choice** fields contain a single value chosen from a set of valid values. For example, the `Mission` field may contain values such as `Cassini`, `Voyager`,

or [Hubble](#).

- **String** fields contain a single string of arbitrary characters. The formatting is specific to the individual field (e.g. PDS3 volume ID: "COISS_2001", Dataset ID: "CO-E/V/J-ISSNA/ISSWA-2-EDR-V1.0").
- **Range** fields contain either a single value or a pair of values (minimum and maximum). Depending on the field, values may be integers, floating point values, date/time strings, or specially-formatted values such as spacecraft clock count. A single-value field is used for cases where there is only a single value for each observation, such as observation duration (there is only a single duration of time for each observation). Fields with both a minimum and maximum are used when a range of values is appropriate. Examples include observation time (where minimum is the starting time and maximum is the ending time) or right ascension (where minimum and maximum represent the range of right ascension values covered by an observation).

1.3. Retrieving Metadata

Many API calls allow you to choose which metadata fields are returned by specifying the parameter `cols=<fieldid_list>`, where `<fieldid_list>` is a comma-separated list of `fieldid`. For example:

```
| cols=opusid,instrument,planet,target,time1,time2
```

When a `cols` parameter is supported but none is provided, the default columns are used: `opusid,instrument,planet,target,time1,observationduration`.

If a metadata field is a *single-value range*, then that `fieldid` **must** be provided without a numeric suffix (e.g. `observationduration`). However, if a metadata field contains both a minimum and maximum value in the database (e.g. `rightasc` for Right Ascension), then a `1` suffix indicating the minimum a `2` suffix indicating the maximum must be provided. For example:

```
| cols=observationduration,rightasc1,rightasc2
```

However, it would be illegal to say `cols=observationduration1` or `cols=rightasc`.

See the section on [Available Metadata Fields](#) below for more information.

1.4. Performing Searches

Many API calls allow you to select which observations you want to return by specifying a set of search constraints. If no constraints are specified, all observations in the database are returned. A search constraint consists of a `searchid` and a desired value. For example:

```
| volumeid=COISS_2001
```

When searching on a multiple-choice field, additional search values can be specified separated by commas. In this case, observations matching any of the values are returned:

```
| planet=Saturn,Uranus,Neptune
```

Multiple-choice values are case-insensitive.

More than one search constraint can be specified by joining them with `&`. When search constraints are specified for different metadata fields, they are "AND"ed together. For example:

```
| volumeid=COISS_2001&planet=Saturn,Uranus,Neptune
```

will return any observation with Volume ID `COISS_2001` and a Planet value of `Saturn`, `Uranus`, or `Neptune`.

All numeric ranges may be searched by specifying a minimum value (`1` suffix), maximum value (`2` suffix), or both. These suffixes should not be confused with the suffixes used to return metadata. In the case of searches, any range field, whether single-value or not, can have a minimum and maximum search value:

```
| observationduration1=10&observationduration2=20
```

Fields containing longitudes are treated specially and the minimum search value may be greater than the maximum, in which case the search "wraps around" 360 degrees. For example, it is reasonable to search on a longitude range of 350 to 10 degrees. This will give the opposite results of searching on 10 to 350 degrees.

1.4.1. Query Types

When performing a search, all string and some range fields may have an additional "query type" (*qtype*) that describes how the search should be performed. The query type is specified by including `qtype-<searchid>=value` as a search parameter. Note that the `searchid` is always specified without a (`1` or `2`) suffix, even if the search requires suffixes for minimum and maximum values. This is because the `qtype` applies to the entire search field, not to the minimum or maximum values separately. The details of the `qtypes` associated with each field type are given below.

String Fields

Strings can be searched using the following query types:

- **contains**: the search string occurs anywhere within the metadata string. This is the default if no `qtype` is given.
- **begins**: the search string occurs at the beginning of the metadata string.
- **ends**: the search string occurs at the end of the metadata string.
- **matches**: the search string is exactly equal to the metadata string.
- **excludes**: the search string does *not* appear anywhere in the metadata string.
- **regex**: the metadata string matches the given [regular expression](#).

Range Fields

Range fields can be searched using the following query types:

- **any**: The observation range overlaps at least some with the search range. In other words, either the observation maximum is greater than the search minimum, or the observation minimum is less than the search maximum. This option is used to request the widest possible set of observations that contain at least some of the range you are searching for. This is the default if no `qtype` is given.
- **all**: The observation range is a strict superset of the search range. In other words, the observation minimum is less than the search minimum, and the observation maximum is greater than the search maximum. This option is used to ensure that an entire feature you are looking for (such as a crater) is visible in the observation.
- **only**: The observation range is a strict subset of the search range. In other words, the observation minimum is greater than the search minimum, and the observation maximum is less than the search maximum. This option is used to tightly constrain your search to the smallest possible set of results.

1.4.2. Units

When performing a search, some range fields have an additional `unit` that describes what units the search values are in. If no unit is specified, the default for that field is used. The unit is specified by including `unit-<searchid>=value` as a search parameter. Note that the `searchid` is always specified without a suffix, even if the search requires suffixes for minimum and maximum values.

1.4.3. Multiple Clauses

Multiple string and range constraints can be specified for the same field. In this case, the multiple constraints are "OR"ed together. To distinguish between the constraints, the `searchids` are suffixed with `_N` where `N` is any positive integer. For example:

```
| observationduration1_1=10&observationduration2_1=20&observationduration1_2=30&observationduration2_2=40
```

would search for Observation Duration between 10 and 20 seconds (inclusive) *or* between 30 and 40 seconds (inclusive). Each clause can have its own `qtype` and `unit`, if applicable.

1.4.4. Sorting

By default, the results of a search are sorted first by Observation Start Time (`time1`) and then by OPUS ID (`opusid`). This order can be changed by specifying `order=<fieldid_list>`, where `<fieldid_list>` contains one or more `fieldids` (as would be used when retrieving metadata) separated by commas. If multiple `fieldids` are given, the sorting proceeds by the first `fieldid`, and then if the values are identical by the second `fieldid`, etc. Sorting is normally done in ascending order, but may be changed to descending for a particular field by prepending the `fieldid` with a minus sign (-).

Note that if `opusid` does not appear in the sort order list, it will automatically be added at the end. Since all OPUS IDs are unique, this guarantees the resulting order is deterministic.

1.4.5. Examples

- To search for Data Set IDs that contain "ISS" anywhere (the `qtype` is optional):

```
| datasetid=ISS&qtype-datasetid=contains
```

- To search for Data Set IDs that start with "CO-E":

```
| datasetid=CO-E&qtype-datasetid=begins
```

- To search for Volume IDs "COISS_2001" or "COISS_2002":

```
| volumeid_1=COISS_2001&qtype-volumeid_1=matches&volumeid_2=COISS_2002&qtype-volumeid_2=matches
```

- To search for ring radii between 110,000 and 130,000 km using the "any" `qtype` (the `qtype` is optional):

```
| RINGGEOringradius1=110000&RINGGEOringradius2=130000
| RINGGEOringradius1=110000&RINGGEOringradius2=130000&qtype-RINGGEOringradius=any
```

- To search for ring radii between 1.3 and 1.7 Saturn radii using the "only" `qtype`:

```
| RINGGEOringradius1=1.3&RINGGEOringradius2=1.7&unit-RINGGEOringradius=saturnradii&qtype-RINGGEOringradius=only
```

- To search for all Hubble images taken of Jupiter or Saturn in 1994 or 2001 with a spectral bandpass limited to 400-700 nm:

```
| mission=Hubble&observationtype=Image&planet=Jupiter,Saturn&time1_1=1994-01-01T00:00:00.000&time2_1=1994-12-31
| T23:59:59.999&qtype-time_1=any&time1_2=2001-01-01T00:00:00.000&time2_2=2002-12-31T23:59:59.999&qtype-time_2=
| any&wavelength1=400&wavelength2=700&qtype-wavelength=only&unit-wavelength=nm
```

- To search for all Cassini ISS images sorted by filter name then in reverse order by observation duration, and finally by OPUS ID:

```
| instrument=Cassini+ISS&order=COISSfilter,-observationduration,opusid
```

2. API Calls

2.1. Return Formats

All API calls take a suffix `.fmt` specifying the format in which to return data. Possible values are:

- **json**: Return all data in a JSON structure. This is most useful for programs wanting to process the returned data directly. Note that some JSON returns may

contain data that is not detailed in this document. This data is usually provided for backwards compatibility with legacy applications and should **not** be relied on for new development.

- **csv**: Return all data in a comma-separated value (CSV) file, suitable for import into a spreadsheet program.
- **html**: Return all data as an HTML document. This is most useful when viewing directly in a browser. Note that the returned HTML has minimal formatting and does not include any header or **body** tags.
- **zip**: Return all data as a ZIP file.

Not all API calls provide results in all formats. The formats supported are listed with each call.

2.2. Getting Metadata

2.2.1. `api/data.[fmt]` - Return Metadata from a Search

Get data for observations based on search criteria, sort order, and requested metadata fields. Data is returned in chunks (called "pages" in the returned JSON) to limit return size. The starting observation number and the number of observations desired can be specified.

Supported return formats: `json`, `html`, `csv`

Parameters

Parameter	Description	Default
<code><searchid>=<value></code>	Search parameters (including sort order)	All observations in database
<code>cols=<fieldid_list></code>	Metadata fields to return	Default columns
<code>startobs=<N></code>	The (1-based) observation number to start with	1
<code>limit=<N></code>	The maximum number of observations to return	100

JSON Return Format

The return value is a JSON object containing these fields:

Field Name	Description
<code>start_obs</code>	Requested starting observation
<code>limit</code>	Requested limit
<code>count</code>	Number of observations actually returned
<code>available</code>	Total number of observations available from this search
<code>order</code>	Sort order used
<code>labels</code>	Requested metadata field names (fully qualified) in the order requested with <code>cols</code>
<code>page</code>	The observation data

`page` is a list with one entry per returned observation. Each entry is itself a list, with one entry per requested metadata field, in the same order as was requested with `cols`.

Example:

- Retrieve data in JSON format for the first three Cassini ISS images that contain Enceladus' south pole (latitude 70 degrees or greater) and have a phase angle at Enceladus of 160 degrees or greater.

https://opus.pds-rings.seti.org/opus/api/data.json?instrument=Cassini+ISS&SURFACEGEOenceladus_planetographiclatitude1=70&SURFACEGEOenceladus_centerphaseangle1=160&order=time1&cols=opusid,target,time1,SURFACEGEOenceladus_centerphaseangle&startobs=5&limit=3

Return value:

```

{
  "start_obs": 5
  "limit": 3,
  "count": 3,
  "available": 81,
  "order": "time1,opusid",
  "labels": [
    "OPUS ID",
    "Intended Target Name",
    "Observation Start Time",
    "Phase Angle at Body Center [Enceladus] (degrees)"
  ],
  "page": [
    [
      "co-iss-n1635813867",
      "Enceladus",
      "2009-11-02T00:01:22.626",
      "161.414"
    ],
    [
      "co-iss-n1635814065",
      "Enceladus",
      "2009-11-02T00:03:38.237",
      "161.519"
    ],
    [
      "co-iss-n1635814245",
      "Enceladus",
      "2009-11-02T00:07:43.051",
      "161.657"
    ]
  ]
}

```

CSV Return Format

The return value is a series of text lines. The first line contains the names of the requested metadata fields. After that is one line per observation containing the requested metadata.

Example:

- Retrieve data in CSV format for the first three Cassini ISS images that contain Enceladus' south pole (latitude 70 degrees or greater) and have a phase angle at Enceladus of 160 degrees or greater.

https://opus.pds-rings.seti.org/opus/api/data.csv?instrument=Cassini+ISS&SURFACEGEOenceladus_planetographiclatitude1=70&SURFACEGEOenceladus_centerphaseangle1=160&order=time1&cols=opusid,target,time1,SURFACEGEOenceladus_centerphaseangle&startobs=5&limit=3

Return value:

```

OPUS ID,Intended Target Name,Observation Start Time,Phase Angle at Body Center [Enceladus] (degrees)
co-iss-n1635813867,Enceladus,2009-11-02T00:01:22.626,161.414
co-iss-n1635814065,Enceladus,2009-11-02T00:03:38.237,161.519
co-iss-n1635814245,Enceladus,2009-11-02T00:07:43.051,161.657

```

HTML Return Format

The return value is an HTML table. The table header contains the names of the requested metadata fields. The table rows contain the requested metadata.

Example:

- Retrieve data in HTML format for the first three Cassini ISS images that contain Enceladus' south pole (latitude 70 degrees or greater) and have a phase angle at Enceladus of 160 degrees or greater.

https://opus.pds-rings.seti.org/opus/api/data.html?instrument=Cassini+ISS&SURFACEGEOenceladus_planetographiclatitude1=70&SURFACEGEOenceladus_centerphaseangle1=160&order=time1&cols=opusid,target,time1,SURFACEGEOenceladus_centerphaseangle&startobs=5&limit=3

Return value:

```

<table>
<tr>
<th>OPUS ID</th>
<th>Intended Target Name</th>
<th>Observation Start Time</th>
<th>Phase Angle at Body Center [Enceladus] (degrees)</th>
</tr>
<tr>
<td>co-iss-n1635813867</td>
<td>Enceladus</td>
<td>2009-11-02T00:01:22.626</td>
<td>161.414</td>
</tr>
<tr>
<td>co-iss-n1635814065</td>
<td>Enceladus</td>
<td>2009-11-02T00:03:38.237</td>
<td>161.519</td>
</tr>
<tr>
<td>co-iss-n1635814245</td>
<td>Enceladus</td>
<td>2009-11-02T00:07:43.051</td>
<td>161.657</td>
</tr>
</table>

```

2.2.2. [api/metadata_v2/\[opusid\].\[fmt\]](#) - Return Metadata for an OPUSID

Get all available, or particular, metadata for a single observation.

Supported return formats: [json](#), [html](#), [csv](#)

Parameters

Parameter	Description	Default
<code>cols=<field list></code>	Metadata fields to return	All columns
<code>cats=<categories></code>	If supplied, only returns data for these categories; if <code>cols</code> is supplied, <code>cats</code> is ignored	All categories

`categories` is a list of category names separated by commas. Category names can either be full names ending in "Constraints" (e.g. [PDS Constraints](#) or [Cassini ISS Constraints](#)) or abbreviated names representing internal database tables (`obs_pds`, `obs_mission_cassini`, or `obs_instrument_coiss`). Full category names must replace spaces with `+` or another appropriate encoding. The list of categories available for an `opusid` can be retrieved with [api/categories/\[opusid\].json](#).

JSON Return Format

If the `cols` parameter is supplied, the return value is a JSON object containing a list of objects each with a single name/value pair `{<fieldid>: <value>}`. If the `cols` parameter is not supplied, the return value is a JSON object containing name/value pairs `{<category>: <data>}` where `data` is a list of objects each with a single name/value pair `{<fieldid>: <value>}`.

Examples:

- Retrieve all metadata for a single Cassini ISS Saturn observation in JSON format:

https://opus.pds-rings.seti.org/opus/api/metadata_v2/co-iss-w1866600688.json

Return value:

```

{
  "General Constraints": {
    "planet": "Saturn",
    "target": "Saturn",
    [...]
  },
  "PDS Constraints": {
    "volumeid": "COISS_2111",
    "datasetid": "CO-S-ISSNA/ISSWA-2-EDR-V1.0",
    [...]
  },
  [...]
}

```

- Retrieve start and stop time only for a single Cassini ISS Saturn observation in JSON format:

https://opus.pds-rings.seti.org/opus/api/metadata_v2/co-iss-w1866600688.json?cols=time1,time2

Return value:

```
[
  {
    "time1": "2017-02-24T03:03:29.866"
  },
  {
    "time2": "2017-02-24T03:03:33.666"
  }
]
```

- Retrieve PDS and Images Constraints only for a single Cassini ISS Saturn Observation in JSON format:

https://opus.pds-rings.seti.org/opus/api/metadata_v2/co-iss-w1866600688.json?cats=PDS+Constraints,Image+Constraints

Return value:

```
{
  "PDS Constraints": {
    "volumeid": "COISS_2111",
    "datasetid": "CO-S-ISSNA/ISSWA-2-EDR-V1.0",
    "productid": "1_W1866600688.122",
    "productcreationtime": "2017-02-25T09:50:35.000",
    "primaryfilespec": "COISS_2111/data/1866491385_1866605022/W1866600688_1.IMG",
    "opusid": "co-iss-w1866600688",
    "note": "N/A"
  },
  "Image Constraints": {
    "duration": "3.8000",
    "greaterpixelsize": "1024",
    "lesserpixelsize": "1024",
    "levels": "4096",
    "imagetype": "Frame"
  }
}
```

CSV Return Format

The return value is a series of text lines. If `cols` is supplied, the return value is a line containing the list of field names followed by a line containing the list of metadata for those fields. If `cols` is not supplied, the return contains, for each category, three lines: the name of the category, the list of field names in that category, and the metadata for those fields.

- Retrieve all metadata for a single Cassini ISS Saturn observation in CSV format:

https://opus.pds-rings.seti.org/opus/api/metadata_v2/co-iss-w1866600688.csv

Return value:

```
General Constraints
Planet,Intended Target Name,Nominal Target Class,Mission, [...]
Saturn,Saturn,Planet,Cassini, [...]
PDS Constraints
Volume ID,Data Set ID,Product ID,Product Creation Time, [...]
COISS_2111,CO-S-ISSNA/ISSWA-2-EDR-V1.0,1_W1866600688.122,2017-02-25T09:50:35.000, [...]
Image Constraints
Exposure Duration (secs),Greater Size in Pixels,Lesser Size in Pixels, [...]
3.8000,1024,1024, [...]
[...]
```

- Retrieve start and stop time only for a single Cassini ISS Saturn observation in CSV format:

https://opus.pds-rings.seti.org/opus/api/metadata_v2/co-iss-w1866600688.csv?cols=time1,time2

Return value:

```
Observation Start Time,Observation Stop Time
2017-02-24T03:03:29.866,2017-02-24T03:03:33.666
```

- Retrieve PDS and Image Constraints only for a single Cassini ISS Saturn Observation in CSV format:

https://opus.pds-rings.seti.org/opus/api/metadata_v2/co-iss-w1866600688.csv?cats=PDS+Constraints,Image+Constraints

Return value:

PDS Constraints

Volume ID,Data Set ID,Product ID,Product Creation Time, [...]

COISS_2111,CO-S-ISSNA/ISSWA-2-EDR-V1.0,1_W1866600688.122,2017-02-25T09:50:35.000, [...]

Image Constraints

Exposure Duration (secs),Greater Size in Pixels,Lesser Size in Pixels, [...]

3.8000,1024,1024, [...]

HTML Return Format

If the `cols` parameter is supplied, the return value is an HTML description list containing name/value pairs where the name is the fully-qualified name of the metadata field. If the `cols` parameter is not supplied, the return value is an HTML description list containing name/value pairs organized by category name.

Examples:

- Retrieve all metadata for a single Cassini ISS Saturn observation in HTML format:

https://opus.pds-rings.seti.org/opus/api/metadata_v2/co-iss-w1866600688.html

Return value:

```
<dl>
<dt>General Constraints</dt>
<dl>
<dt>Planet</dt><dd>Saturn</dd>
<dt>Intended Target Name</dt><dd>Saturn</dd>
[...]
```

- Retrieve start and stop time only for a single Cassini ISS Saturn observation in HTML format:

https://opus.pds-rings.seti.org/opus/api/metadata_v2/co-iss-w1866600688.html?cols=time1,time2

Return value:

```
<dl>
<dt>Observation Start Time</dt><dd>2017-02-24T03:03:29.866</dd>
<dt>Observation Stop Time</dt><dd>2017-02-24T03:03:33.666</dd>
</dl>
```

- Retrieve PDS and Image Constraints only for a single Cassini ISS Saturn Observation in HTML format:

https://opus.pds-rings.seti.org/opus/api/metadata_v2/co-iss-w1866600688.html?cats=PDS+Constraints,Image+Constraints

Return value:

```
<dl>
<dt>PDS Constraints</dt>
<dl>
<dt>Volume ID</dt><dd>COISS_2111</dd>
<dt>Data Set ID</dt><dd>CO-S-ISSNA/ISSWA-2-EDR-V1.0</dd>
<dt>Product ID</dt><dd>1_W1866600688.122</dd>
<dt>Product Creation Time</dt><dd>2017-02-25T09:50:35.000</dd>
<dt>Primary File Spec</dt><dd>COISS_2111/data/1866491385_1866605022/W1866600688_1.IMG</dd>
<dt>OPUS ID</dt><dd>co-iss-w1866600688</dd>
<dt>Note</dt><dd>N/A</dd>
</dl>
<dt>Image Constraints</dt>
<dl>
<dt>Exposure Duration (secs)</dt><dd>3.8000</dd>
<dt>Greater Size in Pixels</dt><dd>1024</dd>
<dt>Lesser Size in Pixels</dt><dd>1024</dd>
<dt>Intensity Levels</dt><dd>4096</dd>
<dt>Image Type</dt><dd>Frame</dd>
</dl>
</dl>
```

2.3. Getting Data

2.3.1. [api/download/\[opusid\].zip](#) - Download Files for an OPUS ID

Download a ZIP file containing all (or some) of the products related to opusid.

Supported return formats: [zip](#).

Parameters

Parameter	Description	Default
<code>urlonly=<N></code>	If <code>urlonly=1</code> is specified, only include the <code>urls.txt</code> file and omit all data files	Include all data files
<code>types=<types></code>	List of product types to return	All product types

The `types` parameter is a list of download product types. Available types can be retrieved with the [api/product_types.json](#) or [api/product_types/\[opusid\].json](#) API calls.

Examples

- Download all product types (including all data files) for a Voyager ISS observation:

<https://opus.pds-rings.seti.org/opus/api/download/vg-iss-2-s-c4360022.zip>

Return value is a zip archive containing the files:

```
C4360022_CALIB.IMG
C4360022_CALIB.LBL
C4360022_CLEANED.IMG
C4360022_CLEANED.LBL
C4360022_full.jpg
C4360022_GEOMA.DAT
C4360022_GEOMA.LBL
C4360022_GEOMA.TAB
C4360022_GEOMED.IMG
C4360022_GEOMED.LBL
C4360022_med.jpg
C4360022_RAW.IMG
C4360022_RAW.LBL
C4360022_RESLOC.DAT
C4360022_RESLOC.LBL
C4360022_RESLOC.TAB
C4360022_small.jpg
C4360022_thumb.jpg
data.csv
manifest.csv
urls.txt
VGISS_6210_inventory.lbl
VGISS_6210_inventory.tab
VGISS_6210_moon_summary.lbl
VGISS_6210_moon_summary.tab
VGISS_6210_ring_summary.lbl
VGISS_6210_ring_summary.tab
VGISS_6210_saturn_summary.lbl
VGISS_6210_saturn_summary.tab
```

- Download all product types (with no data files) for a Voyager ISS observation:

<https://opus.pds-rings.seti.org/opus/api/download/vg-iss-2-s-c4360022.zip?urlonly=1>

Return value is a zip archive containing the files:

```
data.csv
manifest.csv
urls.txt
```

- Download only raw image files for a Galileo SSI observation.

https://opus.pds-rings.seti.org/opus/api/download/go-ssi-c0349632000.zip?types=gossi_raw

Return value is a zip archive containing the files:

C0349632000R.IMG
C0349632000R.LBL
data.csv
manifest.csv
RLINEPRX.FMT
RTLMTAB.FMT
urls.txt

2.3.2. [api/files.json](#) - Return URLs of Files from a Search

Get a list of all (or some) product files for the search results.

Supported return formats: [json](#).

Parameters

Parameter	Description	Default
<searchid>=<value>	Search parameters (including sort order)	All observations in database
startobs=<N>	The (1-based) observation number to start with	1
limit=<N>	The maximum number of observations to return	100
types=<types>	List of product types to return	All product types

The [types](#) parameter is a list of download product types. Available types can be retrieved with the [api/product_types.json](#) or [api/product_types/{opusid}.json](#) API calls.

JSON Return Format

The return value is a JSON object containing these fields:

Field Name	Description
start_obs	Requested starting observation
limit	Requested limit
count	Number of observations actually returned
available	Total number of observations available from this search
order	Sort order
data	The file information for the current version
versions	The file information for all versions (including the current one)

[data](#) and [versions](#) are both objects indexed by opusid. [versions](#) is further indexed by version number. Both are then indexed by product type, which gives a list of URLs of associated files.

Example (see [api/files/{opusid}.json](#) for more):

- Retrieve all files associated with images of Pan in volume COISS_2111 in JSON format.

https://opus.pds-rings.seti.org/opus/api/files.json?volumeid=COISS_2111&target=pan

Return value:

```

{
  "start_obs": 1,
  "limit": 100,
  "count": 56,
  "available": 56,
  "order": "time1,opusid",
  "data": {
    "co-iss-n1867599811": {
      "coiss_raw": [
        "https://opus.pds-rings.seti.org/holdings/volumes/COISS_2xxx/COISS_2111/data/1867558636_1867602962/N1867599811_1.IMG",
        "https://opus.pds-rings.seti.org/holdings/volumes/COISS_2xxx/COISS_2111/data/1867558636_1867602962/N1867599811_1.LBL",
        "https://opus.pds-rings.seti.org/holdings/volumes/COISS_2xxx/COISS_2111/label/prefix3.fmt",
        "https://opus.pds-rings.seti.org/holdings/volumes/COISS_2xxx/COISS_2111/label/tlmtab.fmt"
      ],
      "coiss_calib": [
        "https://opus.pds-rings.seti.org/holdings/calibrated/COISS_2xxx/COISS_2111/data/1867558636_1867602962/N1867599811_1_CALIB.IMG",
        "https://opus.pds-rings.seti.org/holdings/calibrated/COISS_2xxx/COISS_2111/data/1867558636_1867602962/N1867599811_1_CALIB.LBL"
      ],
      "coiss_thumb": [
        "https://opus.pds-rings.seti.org/holdings/volumes/COISS_2xxx/COISS_2111/extras/thumbnail/1867558636_1867602962/N1867599811_1.IMG.jpeg_small"
      ],
      [...]
    },
    "co-iss-n1867600166": {
      "coiss_raw": [
        "https://opus.pds-rings.seti.org/holdings/volumes/COISS_2xxx/COISS_2111/data/1867558636_1867602962/N1867600166_1.IMG",
        "https://opus.pds-rings.seti.org/holdings/volumes/COISS_2xxx/COISS_2111/data/1867558636_1867602962/N1867600166_1.LBL",
        "https://opus.pds-rings.seti.org/holdings/volumes/COISS_2xxx/COISS_2111/label/prefix3.fmt",
        "https://opus.pds-rings.seti.org/holdings/volumes/COISS_2xxx/COISS_2111/label/tlmtab.fmt"
      ],
      [...]
    },
    [...]
  ]
}

```

2.3.3. [api/files/\[opusid\].json](#) - Return URLs of Files for an OPUS ID

Get the URLs of all (or some) product files available for a single observation.

Supported return formats: [json](#).

Parameters

Parameter	Description	Default
<code>types=<types></code>	List of product types to return	All product types

The `types` parameter is a list of download product types. Available types can be retrieved with the [api/product_types.json](#) or [api/product_types/\[opusid\].json](#) API calls.

JSON Return Format

The return value is a JSON object containing these fields:

Field Name	Description
<code>data</code>	The file information for the current version
<code>versions</code>	The file information for all versions (including the current one)

`data` and `versions` are both objects indexed by opusid. `versions` is further indexed by version number. Both are then indexed by product type, which gives a list of URLs of associated files.

Examples:

- Retrieve all files associated with a Voyager ISS observation in JSON format.

<https://opus.pds-rings.seti.org/opus/api/files/vg-iss-2-s-c4360022.json>

Return value:

```
{
  "data": {
    "vg-iss-2-s-c4360022": {
      "vgiss_raw": [
        "https://opus.pds-rings.seti.org/holdings/volumes/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_RAW.IMG",
        "https://opus.pds-rings.seti.org/holdings/volumes/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_RAW.LBL"
      ],
      "vgiss_cleaned": [
        "https://opus.pds-rings.seti.org/holdings/volumes/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_CLEANED.IMG",
        "https://opus.pds-rings.seti.org/holdings/volumes/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_CLEANED.LBL"
      ],
      "vgiss_calib": [
        "https://opus.pds-rings.seti.org/holdings/volumes/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_CALIB.IMG",
        "https://opus.pds-rings.seti.org/holdings/volumes/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_CALIB.LBL"
      ],
      [...]
    }
  },
  "versions": {
    "vg-iss-2-s-c4360022": {
      "Current": {
        "vgiss_raw": [
          "https://opus.pds-rings.seti.org/holdings/volumes/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_RAW.IMG",
          "https://opus.pds-rings.seti.org/holdings/volumes/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_RAW.LBL"
        ],
        "vgiss_cleaned": [
          "https://opus.pds-rings.seti.org/holdings/volumes/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_CLEANED.IMG",
          "https://opus.pds-rings.seti.org/holdings/volumes/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_CLEANED.LBL"
        ],
        "vgiss_calib": [
          "https://opus.pds-rings.seti.org/holdings/volumes/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_CALIB.IMG",
          "https://opus.pds-rings.seti.org/holdings/volumes/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_CALIB.LBL"
        ],
        [...]
      }
    }
  }
}
```

- Retrieve raw images only for a Galileo SSI observation in JSON format.

https://opus.pds-rings.seti.org/opus/api/files/go-ssi-c0349632000.json?types=qossi_raw

Return value:

```

{
  "data": {
    "go-ssi-c0349632000": {
      "gossi_raw": [
        "https://opus.pds-rings.seti.org/holdings/volumes/GO_0xxx/GO_0017/G1/GANYMEDE/C0349632000R.IMG",
        "https://opus.pds-rings.seti.org/holdings/volumes/GO_0xxx/GO_0017/G1/GANYMEDE/C0349632000R.LBL",
        "https://opus.pds-rings.seti.org/holdings/volumes/GO_0xxx/GO_0017/LABEL/RLINEPRX.FMT",
        "https://opus.pds-rings.seti.org/holdings/volumes/GO_0xxx/GO_0017/LABEL/RTLMTAB.FMT"
      ]
    }
  },
  "versions": {
    "go-ssi-c0349632000": {
      "1": {
        "gossi_raw": [
          "https://opus.pds-rings.seti.org/holdings/volumes/GO_0xxx_v1/GO_0017/G1/GANYMEDE/C034963/2000R.IMG",
          "https://opus.pds-rings.seti.org/holdings/volumes/GO_0xxx_v1/GO_0017/G1/GANYMEDE/C034963/2000R.LBL",
          "https://opus.pds-rings.seti.org/holdings/volumes/GO_0xxx_v1/GO_0017/LABEL/RLINEPRX.FMT",
          "https://opus.pds-rings.seti.org/holdings/volumes/GO_0xxx_v1/GO_0017/LABEL/RTLMTAB.FMT"
        ]
      },
      "Current": {
        "gossi_raw": [
          "https://opus.pds-rings.seti.org/holdings/volumes/GO_0xxx/GO_0017/G1/GANYMEDE/C0349632000R.IMG",
          "https://opus.pds-rings.seti.org/holdings/volumes/GO_0xxx/GO_0017/G1/GANYMEDE/C0349632000R.LBL",
          "https://opus.pds-rings.seti.org/holdings/volumes/GO_0xxx/GO_0017/LABEL/RLINEPRX.FMT",
          "https://opus.pds-rings.seti.org/holdings/volumes/GO_0xxx/GO_0017/LABEL/RTLMTAB.FMT"
        ]
      }
    }
  }
}

```

- Retrieve drizzle images from an HST WFC3 observation with multiple versions in JSON format.

<https://opus.pds-rings.seti.org/opus/api/files/hst-11559-wfc3-ib4v19rp.json>

Return value:

```

{
  "data": {
    "hst-11559-wfc3-ib4v19rp": {
      "hst_calib": [
        "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ_FLT.JPG",
        "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ.LBL"
      ],
      "hst_drizzled": [
        "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ_DRZ.JPG",
        "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ.LBL"
      ]
    }
  },
  "versions": {
    "hst-11559-wfc3-ib4v19rp": {
      "Current": {
        "hst_calib": [
          "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ_FLT.JPG",
          "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ.LBL"
        ],
        "hst_drizzled": [
          "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ_DRZ.JPG",
          "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ.LBL"
        ]
      },
      "1.1": {
        "hst_calib": [
          "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx_v1.1/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ_FLT.JPG",
          "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx_v1.1/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ.LBL"
        ],
        "hst_drizzled": [
          "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx_v1.1/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ_DRZ.JPG",
          "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx_v1.1/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ.LBL"
        ]
      },
      "1.0": {
        "hst_calib": [
          "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx_v1.0/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ_FLT.JPG",
          "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx_v1.0/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ.LBL"
        ],
        "hst_drizzled": [
          "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx_v1.0/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ_DRZ.JPG",
          "https://opus.pds-rings.seti.org/holdings/volumes/HSTIx_xxxx_v1.0/HSTI1_1559/DATA/VISIT_19/IB4V19RPQ.LBL"
        ]
      }
    }
  }
}

```

2.3.4. [api/images.\[fmt\]](#) - Return URLs of All Images from a Search

2.3.5. [api/images/\[size\].\[fmt\]](#) - Return URLs of Images of a Specific Size from a Search

2.3.6. [api/image/\[size\]/\[opusid\].\[fmt\]](#) - Return URLs of Images of a Specific Size for an OPUS ID

Get the URLs of images of all sizes (or a given size) based on search criteria and sort order. Image URLs are returned in chunks to limit return size. The starting observation number and the number of observations desired can be specified. An image of a specific size may also be returned for a single OPUS ID.

If specified, `[size]` must be one of `full`, `med`, `small`, or `thumb`.

Supported return formats: `json`, `csv`. `html` is also supported when a specified size is requested.

Parameters

Parameter	Description	Default
<code><searchid>=<value></code>	Search parameters (including sort order)	All observations in database
<code>startobs=<N></code>	The (1-based) observation number to start with	1
<code>limit=<N></code>	The maximum number of observations to return	100

JSON Return Format

The return value is a JSON object containing this field:

Field Name	Description
<code>data</code>	The images data with one entry per returned observation

When a search was requested, the JSON object also includes these fields:

Field Name	Description
<code>start_obs</code>	Requested starting observation
<code>limit</code>	Requested limit
<code>count</code>	Number of observations actually returned
<code>available</code>	Total number of observations available from this search
<code>order</code>	Sort order
<code>labels</code>	Requested metadata field names (fully qualified)

When all sizes are requested, `data` is an object containing a series of entries, each with these fields:

Field Name	Description
<code>opusid</code>	OPUS ID of the observation
<code><size>_alt_text</code>	Alternate text (image filename)
<code><size>_size_bytes</code>	Size of the image file in bytes
<code><size>_width</code>	Width of the image in pixels
<code><size>_height</code>	Height of the image in pixels
<code><size>_url</code>	Full URL path to the image

When one size is requested, `data` an object containing a single entry with these fields:

Field Name	Description
<code>opusid</code>	OPUS ID of the observation
<code>alt_text</code>	Alternate text (image filename)
<code>size_bytes</code>	Size of the image file in bytes
<code>width</code>	Width of the image in pixels
<code>height</code>	Height of the image in pixels
<code>url</code>	Full URL path to the image

Examples:

- Retrieve information in JSON format about all sizes of images for observations 10-11 from Cassini ISS volume COISS_2002.

https://opus.pds-rings.seti.org/opus/api/images.json?volumeid=COISS_2002&startobs=10&limit=2

Return value:

```

{
  "start_obs": 10,
  "limit": 2,
  "count": 2,
  "available": 3296,
  "order": "time1,opusid"
  "data": [
    {
      "opusid": "co-iss-n1460962327",
      "thumb_url": "https://opus.pds-rings.seti.org/holdings/previews/COISS_2xxx/COISS_2002/data/1460960653_1461048959/
N1460962327_1_thumb.jpg",
      "thumb_alt_text": "N1460962327_1_thumb.jpg",
      "thumb_size_bytes": 864,
      "thumb_width": 100,
      "thumb_height": 100,
      "small_url": "https://opus.pds-
rings.seti.org/holdings/previews/COISS_2xxx/COISS_2002/data/1460960653_1461048959/N1460962327_1_small.jpg",
      "small_alt_text": "N1460962327_1_small.jpg",
      "small_size_bytes": 1729,
      "small_width": 256,
      "small_height": 256,
      [...]
    },
    [...]
  ]
}

```

- Retrieve information in JSON format about medium-size images for observations 10-11 from Cassini ISS volume COISS_2002.

https://opus.pds-rings.seti.org/opus/api/images/med.json?volumeid=COISS_2002&startobs=10&limit=2

Return value:

```

{
  "start_obs": 10,
  "limit": 2,
  "count": 2,
  "available": 3296,
  "order": "time1,opusid",
  "data": [
    {
      "opusid": "co-iss-n1460962327",
      "alt_text": "N1460962327_1_med.jpg",
      "size_bytes": 4971,
      "width": 512,
      "height": 512,
      "url": "https://opus.pds-
rings.seti.org/holdings/previews/COISS_2xxx/COISS_2002/data/1460960653_1461048959/N1460962327_1_med.jpg"
    },
    {
      "opusid": "co-iss-n1460962415",
      "alt_text": "N1460962415_1_med.jpg",
      "size_bytes": 4991,
      "width": 512,
      "height": 512,
      "url": "https://opus.pds-
rings.seti.org/holdings/previews/COISS_2xxx/COISS_2002/data/1460960653_1461048959/N1460962415_1_med.jpg"
    }
  ]
}

```

- Retrieve information in JSON format about the full-size image for OPUS ID vg-iss-2-s-c4360022.

<https://opus.pds-rings.seti.org/opus/api/image/full/vg-iss-2-s-c4360022.json>

Return value:


```

{
  "data": [
    {
      "opusid": "vg-iss-2-s-c4360022",
      "alt_text": "C4360022_full.jpg",
      "size_bytes": 24607,
      "width": 800,
      "height": 800,
      "url": "https://opus.pds-rings.seti.org/holdings/previews/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_full.jpg"
    }
  ]
}

```

CSV Return Format

The return value is a series of text lines. The first returned line contains the column headers. After that is one line per observation containing the information about each image.

Example:

- Retrieve information in CSV format about all sizes of images for observations 10-11 from Cassini ISS volume COISS_2002.

https://opus.pds-rings.seti.org/opus/api/images.csv?volumeid=COISS_2002&startobs=10&limit=2

Return value:

```

OPUS ID,Thumb URL,Small URL,Med URL,Full URL
co-iss-n1460962327,https://opus.pds-rings.seti.org/holdings/previews/COISS_2xxx/COISS_2002/data/1460960653_1461048959/N1460962327_1_full.png
co-iss-n1460962415,https://opus.pds-rings.seti.org/holdings/previews/COISS_2xxx/COISS_2002/data/1460960653_1461048959/N1460962415_1_full.png

```

- Retrieve information in CSV format about medium-size images for observations 10-11 from Cassini ISS volume COISS_2002.

https://opus.pds-rings.seti.org/opus/api/images/med.csv?volumeid=COISS_2002&startobs=10&limit=2

Return value:

```

OPUS ID,URL
co-iss-n1460962327,https://opus.pds-rings.seti.org/holdings/previews/COISS_2xxx/COISS_2002/data/1460960653_1461048959/N1460962327_1_med.jpg
co-iss-n1460962415,https://opus.pds-rings.seti.org/holdings/previews/COISS_2xxx/COISS_2002/data/1460960653_1461048959/N1460962415_1_med.jpg

```

- Retrieve information in CSV format about the full-size image for OPUS ID vg-iss-2-s-c4360022.

<https://opus.pds-rings.seti.org/opus/api/image/full/vg-iss-2-s-c4360022.csv>

Return value:

```

OPUS ID,URL
vg-iss-2-s-c4360022,https://opus.pds-rings.seti.org/holdings/previews/VGISS_6xxx/VGISS_6210/DATA/C43600XX/C4360022_full.jpg

```

HTML Return Format

The return is an HTML list containing the URLs of the requested images.

Example:

- Retrieve information in HTML format about medium-size images for observations 10-11 from Cassini ISS volume COISS_2002.

https://opus.pds-rings.seti.org/opus/api/images/med.html?volumeid=COISS_2002&startobs=10&limit=2

Return value:

```

<ul>
<li>

</li>
<li>

</li>
</ul>

```

- Retrieve information in HTML format about the full-size image for OPUS ID vg-iss-2-s-c4360022.

<https://opus.pds-rings.seti.org/opus/api/image/full/vg-iss-2-s-c4360022.html>

Return value:

```
<ul>
<li>

</li>
</ul>
```

2.4. Getting Information About Search Results

2.4.1. `api/meta/result_count.[fmt]` - Result Count for a Search

Get the result count for a search.

Supported return formats: `json`, `html`, `csv`

Parameters

Parameter	Description	Default
<code><searchid>=<value></code>	Search parameters (including sort order)	All observations in database

Specifying a sort order will not change the number of results, but will be used to cache the actual results in order so that future attempts to perform the search will be faster. Thus if you are planning to perform the search again to retrieve metadata, it is recommended to specify a sort order (if not using the default order) when calling `api/meta/result_count.[fmt]` as well.

JSON Return Format

The return value is a JSON object containing these fields:

Field Name	Description
<code>data</code>	An object containing a single <code>result_count</code> field

Example:

- Retrieve the number of observations with Pan as the target in JSON format.

https://opus.pds-rings.seti.org/opus/api/meta/result_count.json?target=Pan

Return value:

```
{
  "data": [
    {
      "result_count": 1636
    }
  ]
}
```

CSV Return Format

The return value is a single text line with the label "result count" followed by the number of results.

- Retrieve the number of observations with Pan as the target in CSV format.

https://opus.pds-rings.seti.org/opus/api/meta/result_count.csv?target=Pan

Return value:

```
result count,1636
```

HTML Return Format

The return value is an HTML description list containing a single item specifying the label `result_count` and the number of results.

- Retrieve the number of observations with Pan as the target in HTML format.

https://opus.pds-rings.seti.org/opus/api/meta/result_count.csv?target=Pan

Return value:

```
<dl>
<dt>result_count</dt><dd>1636</dd>
</dl>
```

2.4.2. `api/meta/mults/[field].[fmt]` - Return Possible Values for a Multiple-Choice Field

Returns all possible values for a multiple-choice field and the result count for each value if that value were added to the search constraints.

Supported return formats: `json`, `html`, `csv`

Parameters

Parameter	Description	Default
<code><searchid>=<value></code>	Search parameters (including sort order)	All observations in database

Specifying a sort order will not change the results, but will be used to cache the actual results in order so that future attempts to perform the search will be faster. Thus if you are planning to perform the search again to retrieve metadata, it is recommended to specify a sort order (if not using the default order) when calling `api/meta/mults/[field].[fmt]` as well.

JSON Return Format

The return value is a JSON object containing these fields:

Field Name	Description
<code>field_id</code>	The <code>fieldid</code> requested
<code>mults</code>	A JSON object containing the result counts for each choice

Example:

- Retrieve the number of results broken down by `planet` for Hubble observations in JSON format.

<https://opus.pds-rings.seti.org/opus/api/meta/mults/planet.json?mission=Hubble>

Return value:

```
{
  "field_id": "planet",
  "mults": {
    "Earth": 10,
    "Mars": 354,
    "Jupiter": 7956,
    "Saturn": 4885,
    "Uranus": 3395,
    "Neptune": 1800,
    "Pluto": 2051,
    "Other": 892
  }
}
```

CSV Return Format

The return value is two text lines. The first is a list of choices. The second is a list of result counts broken down by choice.

- Retrieve the number of results broken down by `planet` for Hubble observations in CSV format.

<https://opus.pds-rings.seti.org/opus/api/meta/mults/planet.csv?mission=Hubble>

Return value:

```
Earth,Mars,Jupiter,Saturn,Uranus,Neptune,Pluto,Other
10,354,7956,4885,3395,1800,2051,892
```

HTML Return Format

The return value is an HTML description list containing the choices and the result counts broken down by choice.

Example:

- Retrieve the number of results in HTML format broken down by `planet` for Hubble observations.

<https://opus.pds-rings.seti.org/opus/api/meta/mults/planet.csv?mission=Hubble>

Return value:

```

<dl>
<dt>Earth</dt><dd>10</dd>
<dt>Mars</dt><dd>354</dd>
<dt>Jupiter</dt><dd>7956</dd>
<dt>Saturn</dt><dd>4885</dd>
<dt>Uranus</dt><dd>3395</dd>
<dt>Neptune</dt><dd>1800</dd>
<dt>Pluto</dt><dd>2051</dd>
<dt>Other</dt><dd>892</dd>
</dl>

```

2.4.3. [api/meta/range/endpoints/\[field\].\[fmt\]](#) - Return Range Endpoints for a Numeric Field

Return range endpoints for a numeric field, given a search.

Supported return formats: [json](#), [html](#), [csv](#)

Parameters

Parameter	Description	Default
<code><searchid>=<value></code>	Search parameters (including sort order)	All observations in database
<code>units=<unit></code>	The units to use for the returned values	The default unit for the field

Specifying a sort order will not change the results, but will be used to cache the actual results in order so that future attempts to perform the search will be faster. Thus if you are planning to perform the search again to retrieve metadata, it is recommended to specify a sort order (if not using the default order) when calling [api/meta/range/endpoints/\[field\].\[fmt\]](#) as well.

JSON Return Format

The return value is a JSON object containing these fields:

Field Name	Description
<code>min</code>	The minimum value for the field
<code>max</code>	The maximum value for the field
<code>nulls</code>	The number of null values for the field
<code>units</code>	The units of the returned <code>min</code> and <code>max</code> fields

Examples:

- Retrieve the range endpoints in the default units (km) for Observed Ring Radius for all Saturn observations in JSON format.

<https://opus.pds-rings.seti.org/opus/api/meta/range/endpoints/RINGGEOringradius1.json?target=Saturn>

Return value:

```

{
  "min": "334.161",
  "max": "12873823.895",
  "nulls": 125566,
  "units": "km"
}

```

- Retrieve the range endpoints in units of Saturn radii for Observed Ring Radius for all Saturn observations in JSON format.

<https://opus.pds-rings.seti.org/opus/api/meta/range/endpoints/RINGGEOringradius1.json?target=Saturn&units=saturnradii>

Return value:

```

{
  "min": "0.00553888613",
  "max": "213.39008610973",
  "nulls": 125566,
  "units": "saturnradii"
}

```

CSV Return Format

The return value is a series of text lines. The first line contains the column labels `min,max,nulls,units`. The second line contains the associated values.

Examples:

- Retrieve the range endpoints in the default units (km) for Observed Ring Radius for all Saturn observations in CSV format.

https://opus.pds-rings.seti.org/opus/api/meta/range/endpoints/RINGGEOringradius1_csv?target=Saturn

Return value:

```
min,max,nulls,units
334.161,12873823.895,125566,km
```

- Retrieve the range endpoints in units of Saturn radii for Observed Ring Radius for all Saturn observations in CSV format.

https://opus.pds-rings.seti.org/opus/api/meta/range/endpoints/RINGGEOringradius1_json?target=Saturn&units=saturnradii

Return value:

```
min,max,nulls,units
0.00553888613,213.39008610973,125566,saturnradii
```

HTML Return Format

The return value is an HTML description list containing name/value pairs where the name is the label and the value is the associated value.

Examples:

- Retrieve the range endpoints in the default units (km) for Observed Ring Radius for all Saturn observations in HTML format.

https://opus.pds-rings.seti.org/opus/api/meta/range/endpoints/RINGGEOringradius1_html?target=Saturn

Return value:

```
<dl>
<dt>min</dt><dd>334.161</dd>
<dt>max</dt><dd>12873823.895</dd>
<dt>nulls</dt><dd>125566</dd>
<dt>units</dt><dd>km</dd>
</dl>
```

- Retrieve the range endpoints in units of Saturn radii for Observed Ring Radius for all Saturn observations in HTML format.

https://opus.pds-rings.seti.org/opus/api/meta/range/endpoints/RINGGEOringradius1_html?target=Saturn&units=saturnradii

Return value:

```
<dl>
<dt>min</dt><dd>0.00553888613</dd>
<dt>max</dt><dd>213.39008610973</dd>
<dt>nulls</dt><dd>125566</dd>
<dt>units</dt><dd>saturnradii</dd>
</dl>
```

2.4.4. [api/categories.json](#) - Return Categories from a Search

Return all category names common to the results of a particular search.

Supported return formats: [json](#)

Parameters

Parameter	Description	Default
<code><searchid>=<value></code>	Search parameters (including sort order)	All observations in database

Specifying a sort order will not change the results, but will be used to cache the actual results in order so that future attempts to perform the search will be faster. Thus if you are planning to perform the search again to retrieve metadata, it is recommended to specify a sort order (if not using the default order) when calling [api/categories.json](#) as well.

JSON Return Format

The return value is a JSON list of objects each containing information about one category that contains data for all of the observations resulting from the given search. Each category is described by:

Field Name	Description
<code>table_name</code>	The internal database table table (e.g. <code>obs_general</code>)
<code>label</code>	The pretty label as displayed to the user (e.g. <code>General Constraints</code>)

Example:

- Retrieve the categories for all observations that have surface geometry information about Methone in JSON format.

<https://opus.pds-rings.seti.org/opus/api/categories.json?surfacegeometrytargetname=Methone>

Return value:

```
[
  {
    "table_name": "obs_general",
    "label": "General Constraints"
  },
  {
    "table_name": "obs_pds",
    "label": "PDS Constraints"
  },
  {
    "table_name": "obs_type_image",
    "label": "Image Constraints"
  },
  {
    "table_name": "obs_wavelength",
    "label": "Wavelength Constraints"
  },
  {
    "table_name": "obs_occultation",
    "label": "Occultation Constraints"
  },
  {
    "table_name": "obs_surface_geometry__methone",
    "label": "Methone Surface Geometry Constraints"
  },
  {
    "table_name": "obs_ring_geometry",
    "label": "Ring Geometry Constraints"
  }
]
```

2.4.5. [api/categories/\[opusid\].json](#) - Return Categories for an OPUS ID

Return a list of all categories an OPUS ID exists in.

Supported return formats: [json](#)

Parameters

There are no parameters.

JSON Return Format

The return value is a JSON list of objects each containing information about one category that contains data for the given OPUS ID. Each category is described by:

Field Name	Description
table_name	The internal database table name (e.g. obs_general)
label	The pretty label as displayed to the user (e.g. General Constraints)

Example:

- Retrieve the categories for a Cassini ISS observation in JSON format.

<https://opus.pds-rings.seti.org/opus/api/categories/co-iss-w1866600688.json>

Return value:

```
[
  {
    "table_name": "obs_general",
    "label": "General Constraints"
  },
  {
    "table_name": "obs_pds",
    "label": "PDS Constraints"
  },
  {
    "table_name": "obs_type_image",
    "label": "Image Constraints"
  },
  {
    "table_name": "obs_wavelength",
    "label": "Wavelength Constraints"
  },
  {
    "table_name": "obs_occultation",
    "label": "Occultation Constraints"
  },
  {
    "table_name": "obs_surface_geometry_daphnis",
    "label": "Daphnis Surface Geometry Constraints"
  },
  {
    "table_name": "obs_surface_geometry_epimetheus",
    "label": "Epimetheus Surface Geometry Constraints"
  },
  {
    "table_name": "obs_surface_geometry_saturn",
    "label": "Saturn Surface Geometry Constraints"
  },
  {
    "table_name": "obs_ring_geometry",
    "label": "Ring Geometry Constraints"
  },
  {
    "table_name": "obs_mission_cassini",
    "label": "Cassini Mission Constraints"
  },
  {
    "table_name": "obs_instrument_coiss",
    "label": "Cassini ISS Constraints"
  }
]
```

2.4.6. [api/product_types.json](#) - Return Product Types from a Search

Return all download product types and associated product versions available from the results of a particular search.

Supported return formats: [json](#)

Parameters

Parameter	Description	Default
<searchid>=<value>	Search parameters (including sort order)	All observations in database

Specifying a sort order will not change the results, but will be used to cache the actual results in order so that future attempts to perform the search will be faster. Thus if you are planning to perform the search again to retrieve metadata, it is recommended to specify a sort order (if not using the default order) when calling [api/product_types.json](#) as well.

JSON Return Format

The return value is a JSON list of objects each containing information about one product type and version that is available for at least one observation returned by the given search. Each product type and version is described by:

Field Name	Description
category	The category of the product type (e.g. Cassini ISS)
product_type	The abbreviated name of the product type (e.g. coiss_raw)
description	A brief description of the product type (e.g. Raw Image)
version_number	A numerical representation of the version number suitable for sorting (999999 means Current)
version_name	A string representation of the version number

Example:

- Retrieve the product types and versions for all observations that have surface geometry information about Methone in JSON format.

https://opus.pds-rings.seti.org/opus/api/product_types.json?surfacegeometrytargetname=Methone

Return value:

```
[
  {
    "category": "Cassini ISS",
    "product_type": "coiss_raw",
    "description": "Raw image",
    "version_number": 999999,
    "version_name": "Current"
  },
  {
    "category": "Cassini ISS",
    "product_type": "coiss_calib",
    "description": "Calibrated image",
    "version_number": 999999,
    "version_name": "Current"
  },
  {
    "category": "Cassini ISS",
    "product_type": "coiss_calib",
    "description": "Calibrated image",
    "version_number": 10000,
    "version_name": "1.0"
  },
  [...]
]
```

2.4.7. [api/product_types/\[opusid\].json](#) - Return Product Types for an OPUS ID

Return a list of all download product types and associated product versions available for an OPUS ID.

Supported return formats: [json](#)

Parameters

There are no parameters.

JSON Return Format

The return value is a JSON list of objects each containing information about one product type and version that is available for the given OPUS ID. Each product type is described by:

Field Name	Description
category	The category of the product type (e.g. Cassini ISS)
product_type	The abbreviated name of the product type (e.g. coiss_raw)
description	A brief description of the product type (e.g. Raw Image)
version_number	A numerical representation of the version number suitable for sorting (999999 means Current)
version_name	A string representation of the version number

Example:

- Retrieve the product types and versions for a Cassini ISS observation in JSON format.

https://opus.pds-rings.seti.org/opus/api/product_types/co-iss-w1866600688.json

Return value:


```
[
  {
    "category": "Cassini ISS",
    "product_type": "coiss_raw",
    "description": "Raw image",
    "version_number": 999999,
    "version_name": "Current"
  },
  {
    "category": "Cassini ISS",
    "product_type": "coiss_calib",
    "description": "Calibrated image",
    "version_number": 999999,
    "version_name": "Current"
  },
  {
    "category": "Cassini ISS",
    "product_type": "coiss_thumb",
    "description": "Extra preview (thumbnail)",
    "version_number": 999999,
    "version_name": "Current"
  },
  [...]
]
```

2.4.8. `api/fields.[fmt]` - Return Information About All Metadata Fields

Return information about all metadata fields.

Supported return formats: `json`, `csv`

Parameters

Parameter	Description	Default
<code>collapse=<N></code>	If <code>collapse=1</code> is given, collapse all surface geometry entries into single generic-target entries	

JSON Return Format

The return value is a JSON object containing this field:

Field Name	Description
<code>data</code>	An object containing information about all fields

`data` is an object indexed by `fieldid` containing:

Field Name	Description
<code>field_id</code>	The <code>fieldid</code>
<code>category</code>	The full name of the category to which the field belongs
<code>type</code>	The data type of the field
<code>search_label</code>	The field name as shown on the Search tab (without Min/Max qualifiers)
<code>full_search_label</code>	The field name without Min/Max qualifiers but with the category name
<code>label</code>	The field name as shown when displaying results (with Min/Max qualifiers as appropriate)
<code>full_label</code>	The field name with Min/Max qualifiers (as appropriate) but with the category name
<code>available_units</code>	The units that can be used for searching with this field
<code>default_units</code>	The default units when none is specified

`type` can be one of: `multiple`, `string`, `range_integer`, `range_float`, `range_longitude`, `range_time`, or `range_special`.

Examples:

- Retrieve information about all fields in JSON format.

<https://opus.pds-rings.seti.org/opus/api/fields.json>

Return value:

```

{
  "data": {
    "planet": {
      "label": "Planet",
      "search_label": "Planet",
      "full_label": "Planet",
      "full_search_label": "Planet [General]",
      "default_units": null,
      "available_units": null,
      "category": "General Constraints",
      "field_id": "planet"
    },
    [...],
    "rightasc1": {
      "label": "Right Ascension (Min)",
      "search_label": "Right Ascension",
      "full_label": "Right Ascension (Min)",
      "full_search_label": "Right Ascension [General]",
      "default_units": "degrees",
      "available_units": [
        "degrees",
        "hourangle",
        "radians"
      ],
      "category": "General Constraints",
      "field_id": "rightasc1"
    },
    "rightasc2": {
      "label": "Right Ascension (Max)",
      "search_label": "Right Ascension",
      [...],
    },
    [...],
    "SURFACEGEOumbriel_planetographiclatitude1": {
      "label": "Observed Planetographic Latitude (Min)",
      "search_label": "Observed Planetographic Latitude",
      "full_label": "Observed Planetographic Latitude (Min) [Umbriel]",
      "full_search_label": "Observed Planetographic Latitude [Umbriel]",
      "default_units": "degrees",
      "available_units": [
        "degrees",
        "hourangle",
        "radians"
      ],
      "category": "Umbriel Surface Geometry Constraints",
      "field_id": "SURFACEGEOumbriel_planetographiclatitude1"
    },
    "SURFACEGEOumbriel_planetographiclatitude2": {
      "label": "Observed Planetographic Latitude (Max)",
      [...],
    },
    [...],
  }
}

```

- Retrieve information about all fields in JSON format.

<https://opus.pds-rings.seti.org/opus/api/fields.json?collapse=1>

Return value:

```

{
  "data": {
    [...]
    "SURFACEGEO<TARGET>_planetographiclatitude1": {
      "label": "Observed Planetographic Latitude (Min)",
      "search_label": "Observed Planetographic Latitude",
      "full_label": "Observed Planetographic Latitude (Min) [Saturn]",
      "full_search_label": "Observed Planetographic Latitude [Saturn]",
      "default_units": "degrees",
      "available_units": [
        "degrees",
        "hourangle",
        "radians"
      ],
      "category": "<TARGET> Surface Geometry Constraints",
      "field_id": "SURFACEGEO<TARGET>_planetographiclatitude1"
    },
    "SURFACEGEO<TARGET>_planetographiclatitude2": {
      "label": "Observed Planetographic Latitude (Max)",
      "search_label": "Observed Planetographic Latitude",
      "full_label": "Observed Planetographic Latitude (Max) [Saturn]",
      "full_search_label": "Observed Planetographic Latitude [Saturn]",
      "default_units": "degrees",
      "available_units": [
        "degrees",
        "hourangle",
        "radians"
      ],
      "category": "<TARGET> Surface Geometry Constraints",
      "field_id": "SURFACEGEO<TARGET>_planetographiclatitude2"
    },
    [...]
  }
}

```

CSV Return Format

The return value is a series of text lines. The first line contains the column headers. After that is one line per metadata field containing the field information.

Example:

- Retrieve information about all fields in CSV format.

<https://opus.pds-rings.seti.org/opus/api/fields.json>

Return value:

```

Field ID,Category,Search Label,Results Label,Full Search Label,Full Results Label,Old Field ID,Units
planet,General Constraints,Planet,Planet,Planet [General],Planet,,
target,General Constraints,Intended Target Name,Intended Target Name,Intended Target Name [General],Intended Target
Name,,
[...]
```

Field ID	Category	Search Label	Results Label	Full Search Label	Full Results Label	Old Field ID	Units
rightasc1	General Constraints	Right Ascension	Right Ascension (Min)	Right Ascension [General]	Right Ascension (Min)		['degrees', 'hourangle', 'radians']
rightasc2	General Constraints	Right Ascension	Right Ascension (Max)	Right Ascension [General]	Right Ascension (Max)		['degrees', 'hourangle', 'radians']
declination1	General Constraints	Declination	Declination (Min)	Declination [General]	Declination (Min)		['degrees', 'hourangle', 'radians']
declination2	General Constraints	Declination	Declination (Max)	Declination [General]	Declination (Max)		['degrees', 'hourangle', 'radians']

```

[...]
```

2.4.9. [api/fields/\[field\].\[fmt\]](#) - Return Information About a Metadata Field

Return information about a particular metadata field.

Supported return formats: [json](#), [csv](#)

Parameters

There are no parameters.

JSON Return Format

The return value is a JSON object containing this field:

Field Name	Description
data	An object containing information about the requested field

data is an object indexed by **fieldid** containing:

Field Name	Description
field_id	The fieldid
category	The full name of the category to which the field belongs
search_label	The field name as shown on the Search tab (without Min/Max qualifiers)
full_search_label	The field name without Min/Max qualifiers but with the category name
label	The field name as shown when displaying results (with Min/Max qualifiers as appropriate)
full_label	The field name with Min/Max qualifiers (as appropriate) but with the category name
available_units	The units that can be used for searching with this field
default_units	The default units when none is specified

Examples:

- Retrieve information about the **planet** field in JSON format.

<https://opus.pds-rings.seti.org/opus/api/fields/planet.json>

Return value:

```
{
  "data": {
    "planet": {
      "label": "Planet",
      "search_label": "Planet",
      "full_label": "Planet",
      "full_search_label": "Planet [General]",
      "default_units": null,
      "available_units": null,
      "category": "General Constraints",
      "field_id": "planet"
    }
  }
}
```

- Retrieve information about the **SURFACEGEOrhea_centerphaseangle** field in JSON format.

https://opus.pds-rings.seti.org/opus/api/fields/SURFACEGEOrhea_centerphaseangle.json

Return value:

```
{
  "data": {
    "SURFACEGEOrhea_centerphaseangle": {
      "label": "Phase Angle at Body Center",
      "search_label": "Phase Angle at Body Center",
      "full_label": "Phase Angle at Body Center [Rhea]",
      "full_search_label": "Phase Angle at Body Center [Rhea]",
      "default_units": "degrees",
      "available_units": [
        "degrees",
        "hourangle",
        "radians"
      ],
      "category": "Rhea Surface Geometry Constraints",
      "field_id": "SURFACEGEOrhea_centerphaseangle"
    }
  }
}
```

CSV Return Format

The return value is a series of text lines. The first line contains the column headers. After that is one line per metadata field containing the field information.

Example:

- Retrieve information about the `planet` field in CSV format.

<https://opus.pds-rings.seti.org/opus/api/fields.json>

Return value:

**Field ID,Category,Search Label,Results Label,Full Search Label,Full Results Label,Old Field ID,Units
planet,General Constraints,Planet,Planet,Planet [General],Planet,,**

3. Available Metadata Fields

Category	Label Units	Field ID
General Constraints	Planet	planet
General Constraints	Intended Target Name	target
General Constraints	Nominal Target Class	targetclass
General Constraints	Mission	mission
General Constraints	Instrument Host Name	insthost
General Constraints	Instrument Name	instrument
General Constraints	Observation Type	observationtype
General Constraints	Observation Start Time	time1
General Constraints	Observation Stop Time	time2
General Constraints	Observation Duration seconds, milliseconds, minutes, hours, days	observationduration
General Constraints	Measurement Quantity	quantity
General Constraints	Right Ascension (Min) degrees, hourangle, radians	rightasc1
General Constraints	Right Ascension (Max) degrees, hourangle, radians	rightasc2
General Constraints	Declination (Min) degrees, hourangle, radians	declination1
General Constraints	Declination (Max) degrees, hourangle, radians	declination2
General Constraints	RING OBS ID	ringobsid
PDS Constraints	Volume ID	volumeid
PDS Constraints	Data Set ID	datasetid
PDS Constraints	Product ID	productid
PDS Constraints	Product Creation Time	productcreationtime
PDS Constraints	Primary File Spec	primaryfilespec
PDS Constraints	OPUS ID	opusid
PDS Constraints	Note	note
Image Constraints	Exposure Duration seconds, milliseconds, minutes, hours, days	duration
Image Constraints	Greater Size in Pixels	greaterpixelsize
Image Constraints	Lesser Size in Pixels	lesserpixelsize
Image Constraints	Intensity Levels	levels
Image Constraints	Image Type	imagetype
Wavelength Constraints	Wavelength (Min) microns, angstroms, nm, cm	wavelength1
Wavelength Constraints	Wavelength (Max) microns, angstroms, nm, cm	wavelength2
Wavelength Constraints	Wavelength Resolution (Min) microns/pixel, angstroms/pixel, nm/pixel, cm/pixel	waveres1
Wavelength Constraints	Wavelength Resolution (Max) microns/pixel, angstroms/pixel, nm/pixel, cm/pixel	waveres2
Wavelength Constraints	Wavenumber (Min) 1/cm, 1/m	waveno1
Wavelength Constraints	Wavenumber (Max) 1/cm, 1/m	waveno2

Category	Label Units	Field ID
Wavelength Constraints	Wavenumber Resolution (Min) 1/cm/pixel, 1/m/pixel	wavenores1
Wavelength Constraints	Wavenumber Resolution (Max) 1/cm/pixel, 1/m/pixel	wavenores2
Wavelength Constraints	Spectral Information Flag	specflag
Wavelength Constraints	Spectrum Size	specsize
Wavelength Constraints	Polarization Type	polarizationtype
Occultation Constraints	Occultation Type	occtype
Occultation Constraints	Occultation Direction	occdir
Occultation Constraints	Body Occultation Flag	bodyocflag
Occultation Constraints	Temporal Sampling Interval seconds, milliseconds, minutes, hours, days	occtimesampling
Occultation Constraints	Data Quality Score	occddataquality
Occultation Constraints	Detectable Optical Depth (Min)	occddepth1
Occultation Constraints	Detectable Optical Depth (Max)	occddepth2
Occultation Constraints	Wavelength Band	occcwband
Occultation Constraints	Signal Source Name	occcsource
Occultation Constraints	Receiver Host Name	occreceiverhost
Surface Geometry Constraints	Surface Geometry Target Selector	surfacegeometrytargetname
Surface Geometry Constraints	Multiple Target List	surfacegeometrytargetlist
<TARGET> Surface Geometry Constraints	Observed Planetographic Latitude (Min) degrees, hourangle, radians	SURFACEGEO<TARGET>_planetographiclatitude1
<TARGET> Surface Geometry Constraints	Observed Planetographic Latitude (Max) degrees, hourangle, radians	SURFACEGEO<TARGET>_planetographiclatitude2
<TARGET> Surface Geometry Constraints	Sub-Solar Planetographic Latitude degrees, hourangle, radians	SURFACEGEO<TARGET>_subsolarplanetographiclatitude
<TARGET> Surface Geometry Constraints	Sub-Observer Planetographic Latitude degrees, hourangle, radians	SURFACEGEO<TARGET>_subobserverplanetographiclatitude
<TARGET> Surface Geometry Constraints	Observed Planetocentric Latitude (Min) degrees, hourangle, radians	SURFACEGEO<TARGET>_planetocentriclatitude1
<TARGET> Surface Geometry Constraints	Observed Planetocentric Latitude (Max) degrees, hourangle, radians	SURFACEGEO<TARGET>_planetocentriclatitude2
<TARGET> Surface Geometry Constraints	Sub-Solar Planetocentric Latitude degrees, hourangle, radians	SURFACEGEO<TARGET>_subsolarplanetocentriclatitude
<TARGET> Surface Geometry Constraints	Sub-Observer Planetocentric Latitude degrees, hourangle, radians	SURFACEGEO<TARGET>_subobserverplanetocentriclatitude
<TARGET> Surface Geometry Constraints	Observed IAU West Longitude (Min) degrees, hourangle, radians	SURFACEGEO<TARGET>_IAUwestlongitude1
<TARGET> Surface Geometry Constraints	Observed IAU West Longitude (Max) degrees, hourangle, radians	SURFACEGEO<TARGET>_IAUwestlongitude2
<TARGET> Surface Geometry Constraints	Sub-Solar IAU West Longitude degrees, hourangle, radians	SURFACEGEO<TARGET>_subsolarIAUlongitude

Category	Label Units	Field ID
<TARGET> Surface Geometry Constraints	Sub-Observer IAU West Longitude degrees, hourangle, radians	SURFACEGEO<TARGET>_subobserverIAUlongitude
<TARGET> Surface Geometry Constraints	Longitude WRT Observer (Min) degrees, hourangle, radians	SURFACEGEO<TARGET>_observerlongitude1
<TARGET> Surface Geometry Constraints	Longitude WRT Observer (Max) degrees, hourangle, radians	SURFACEGEO<TARGET>_observerlongitude2
<TARGET> Surface Geometry Constraints	Observed Distance to Surface (Min) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	SURFACEGEO<TARGET>_rangetobody1
<TARGET> Surface Geometry Constraints	Observed Distance to Surface (Max) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	SURFACEGEO<TARGET>_rangetobody2
<TARGET> Surface Geometry Constraints	Body Center Distance km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	SURFACEGEO<TARGET>_centerdistance
<TARGET> Surface Geometry Constraints	Finest Observed Resolution (Min) km/pixel, m/pixel	SURFACEGEO<TARGET>_finestresolution1
<TARGET> Surface Geometry Constraints	Finest Observed Resolution (Max) km/pixel, m/pixel	SURFACEGEO<TARGET>_finestresolution2
<TARGET> Surface Geometry Constraints	Coarsest Observed Resolution (Min) km/pixel, m/pixel	SURFACEGEO<TARGET>_coarsestresolution1
<TARGET> Surface Geometry Constraints	Coarsest Observed Resolution (Max) km/pixel, m/pixel	SURFACEGEO<TARGET>_coarsestresolution2
<TARGET> Surface Geometry Constraints	Body Center Resolution km/pixel, m/pixel	SURFACEGEO<TARGET>_centerresolution
<TARGET> Surface Geometry Constraints	Phase Angle at Body Center degrees, hourangle, radians	SURFACEGEO<TARGET>_centerphaseangle
<TARGET> Surface Geometry Constraints	Observed Phase Angle (Min) degrees, hourangle, radians	SURFACEGEO<TARGET>_phase1
<TARGET> Surface Geometry Constraints	Observed Phase Angle (Max) degrees, hourangle, radians	SURFACEGEO<TARGET>_phase2
<TARGET> Surface Geometry Constraints	Observed Incidence Angle (Min) degrees, hourangle, radians	SURFACEGEO<TARGET>_incidence1
<TARGET> Surface Geometry Constraints	Observed Incidence Angle (Max) degrees, hourangle, radians	SURFACEGEO<TARGET>_incidence2
<TARGET> Surface Geometry Constraints	Observed Emission Angle (Min) degrees, hourangle, radians	SURFACEGEO<TARGET>_emission1
<TARGET> Surface Geometry Constraints	Observed Emission Angle (Max) degrees, hourangle, radians	SURFACEGEO<TARGET>_emission2
<TARGET> Surface Geometry Constraints	Observed Local Hour Angle (Min) degrees, hourangle, radians	SURFACEGEO<TARGET>_solarhourangle1
<TARGET> Surface Geometry Constraints	Observed Local Hour Angle (Max) degrees, hourangle, radians	SURFACEGEO<TARGET>_solarhourangle2
Ring Geometry Constraints	Observed Ring Radius (Min) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	RINGGEOringradius1
Ring Geometry Constraints	Observed Ring Radius (Max) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	RINGGEOringradius2

Category	Label Units	Field ID
Ring Geometry Constraints	Observed J2000 Longitude (Min) degrees, hourangle, radians	RINGGEOJ2000longitude1
Ring Geometry Constraints	Observed J2000 Longitude (Max) degrees, hourangle, radians	RINGGEOJ2000longitude2
Ring Geometry Constraints	Sub-Solar J2000 Longitude (Min) degrees, hourangle, radians	RINGGEOsubsolarrringlong1
Ring Geometry Constraints	Sub-Solar J2000 Longitude (Max) degrees, hourangle, radians	RINGGEOsubsolarrringlong2
Ring Geometry Constraints	Observed Solar Hour Angle (Min) degrees, hourangle, radians	RINGGEOsolarhourangle1
Ring Geometry Constraints	Observed Solar Hour Angle (Max) degrees, hourangle, radians	RINGGEOsolarhourangle2
Ring Geometry Constraints	Sub-Observer J2000 Longitude (Min) degrees, hourangle, radians	RINGGEOsubobserverrringlong1
Ring Geometry Constraints	Sub-Observer J2000 Longitude (Max) degrees, hourangle, radians	RINGGEOsubobserverrringlong2
Ring Geometry Constraints	Longitude WRT Observer (Min) degrees, hourangle, radians	RINGGEOlongitudeWRTobserver1
Ring Geometry Constraints	Longitude WRT Observer (Max) degrees, hourangle, radians	RINGGEOlongitudeWRTobserver2
Ring Geometry Constraints	Azimuth WRT Observer (Min) degrees, hourangle, radians	RINGGEOringazimuthWRTobserver1
Ring Geometry Constraints	Azimuth WRT Observer (Max) degrees, hourangle, radians	RINGGEOringazimuthWRTobserver2
Ring Geometry Constraints	Observed Distance to Ring Intercept (Min) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	RINGGEOrangetoringintercept1
Ring Geometry Constraints	Observed Distance to Ring Intercept (Max) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	RINGGEOrangetoringintercept2
Ring Geometry Constraints	Ring Center Distance (Min) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	RINGGEOringcenterdistance1
Ring Geometry Constraints	Ring Center Distance (Max) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	RINGGEOringcenterdistance2
Ring Geometry Constraints	Observed Resolution (Min) km/pixel, m/pixel	RINGGEOresolution1
Ring Geometry Constraints	Observed Resolution (Max) km/pixel, m/pixel	RINGGEOresolution2
Ring Geometry Constraints	Projected Radial Resolution (Min) km/pixel, m/pixel	RINGGEOprojectedradialresolution1
Ring Geometry Constraints	Projected Radial Resolution (Max) km/pixel, m/pixel	RINGGEOprojectedradialresolution2
Ring Geometry Constraints	Observed Phase Angle (Min) degrees, hourangle, radians	RINGGEOphase1
Ring Geometry Constraints	Observed Phase Angle (Max) degrees, hourangle, radians	RINGGEOphase2
Ring Geometry Constraints	Observed Incidence Angle (Min) degrees, hourangle, radians	RINGGEOincidence1

Category	Label Units	Field ID
Ring Geometry Constraints	Observed Incidence Angle (Max) degrees, hourangle, radians	RINGGEOincidence2
Ring Geometry Constraints	Observed Emission Angle (Min) degrees, hourangle, radians	RINGGEOemission1
Ring Geometry Constraints	Observed Emission Angle (Max) degrees, hourangle, radians	RINGGEOemission2
Ring Geometry Constraints	Observed North-Based Incidence (Min) degrees, hourangle, radians	RINGGEOnorthbasedincidence1
Ring Geometry Constraints	Observed North-Based Incidence (Max) degrees, hourangle, radians	RINGGEOnorthbasedincidence2
Ring Geometry Constraints	Observed North-Based Emission (Min) degrees, hourangle, radians	RINGGEOnorthbasedemission1
Ring Geometry Constraints	Observed North-Based Emission (Max) degrees, hourangle, radians	RINGGEOnorthbasedemission2
Ring Geometry Constraints	Solar Ring Elevation (Min) degrees, hourangle, radians	RINGGEOsolarringelev1
Ring Geometry Constraints	Solar Ring Elevation (Max) degrees, hourangle, radians	RINGGEOsolarringelev2
Ring Geometry Constraints	Observer Ring Elevation (Min) degrees, hourangle, radians	RINGGEOobserverringelevation1
Ring Geometry Constraints	Observer Ring Elevation (Max) degrees, hourangle, radians	RINGGEOobserverringelevation2
Ring Geometry Constraints	Ring Center Phase (Min) degrees, hourangle, radians	RINGGEOringcenterphase1
Ring Geometry Constraints	Ring Center Phase (Max) degrees, hourangle, radians	RINGGEOringcenterphase2
Ring Geometry Constraints	Ring Center Incidence (Min) degrees, hourangle, radians	RINGGEOringcenterincidence1
Ring Geometry Constraints	Ring Center Incidence (Max) degrees, hourangle, radians	RINGGEOringcenterincidence2
Ring Geometry Constraints	Ring Center Emission (Min) degrees, hourangle, radians	RINGGEOringcenteremission1
Ring Geometry Constraints	Ring Center Emission (Max) degrees, hourangle, radians	RINGGEOringcenteremission2
Ring Geometry Constraints	Ring Center North-Based Incidence (Min) degrees, hourangle, radians	RINGGEOringcenternorthbasedincidence1
Ring Geometry Constraints	Ring Center North-Based Incidence (Max) degrees, hourangle, radians	RINGGEOringcenternorthbasedincidence2
Ring Geometry Constraints	Ring Center North-Based Emission (Min) degrees, hourangle, radians	RINGGEOringcenternorthbasedemission1
Ring Geometry Constraints	Ring Center North-Based Emission (Max) degrees, hourangle, radians	RINGGEOringcenternorthbasedemission2
Ring Geometry Constraints	Ring Center Opening Angle to Sun (Min) degrees, hourangle, radians	RINGGEOsolarringopeningangle1
Ring Geometry Constraints	Ring Center Opening Angle to Sun (Max) degrees, hourangle, radians	RINGGEOsolarringopeningangle2

Category	Label Units	Field ID
Ring Geometry Constraints	Ring Center Opening Angle to Observer (Min) degrees, hourangle, radians	RINGGEOobserverringopeningangle1
Ring Geometry Constraints	Ring Center Opening Angle to Observer (Max) degrees, hourangle, radians	RINGGEOobserverringopeningangle2
Ring Geometry Constraints	Edge-On Radius (Min) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	RINGGEOedgeonradius1
Ring Geometry Constraints	Edge-On Radius (Max) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	RINGGEOedgeonradius2
Ring Geometry Constraints	Edge-On J2000 Longitude (Min) degrees, hourangle, radians	RINGGEOedgeonJ2000longitude1
Ring Geometry Constraints	Edge-On J2000 Longitude (Max) degrees, hourangle, radians	RINGGEOedgeonJ2000longitude2
Ring Geometry Constraints	Edge-On Solar Hour Angle (Min) degrees, hourangle, radians	RINGGEOedgeonsolarhourangle1
Ring Geometry Constraints	Edge-On Solar Hour Angle (Max) degrees, hourangle, radians	RINGGEOedgeonsolarhourangle2
Ring Geometry Constraints	Edge-On Distance to Ring Intercept (Min) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	RINGGEOrangetoedgeonpoint1
Ring Geometry Constraints	Edge-On Distance to Ring Intercept (Max) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	RINGGEOrangetoedgeonpoint2
Ring Geometry Constraints	Edge-On Radial Resolution (Min) km/pixel, m/pixel	RINGGEOedgeonradialresolution1
Ring Geometry Constraints	Edge-On Radial Resolution (Max) km/pixel, m/pixel	RINGGEOedgeonradialresolution2
Ring Geometry Constraints	Edge-On Altitude (Min) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	RINGGEOedgeonaltitude1
Ring Geometry Constraints	Edge-On Altitude (Max) km, m, jupiterradii, saturnradii, neptuneradii, uranusradii	RINGGEOedgeonaltitude2
Ring Geometry Constraints	Ring Intercept Start Time	RINGGEOringintercepttime1
Ring Geometry Constraints	Ring Intercept Stop Time	RINGGEOringintercepttime2
Cassini Mission Constraints	Observation Name	CASSINIobsname
Cassini Mission Constraints	Activity Name	CASSINIactivityname
Cassini Mission Constraints	Mission Phase	CASSINImissionphasename
Cassini Mission Constraints	Cassini Target Code	CASSINItargetcode
Cassini Mission Constraints	Cassini Original Target Name	CASSINItargetname
Cassini Mission Constraints	None	CASSINIrevno
Cassini Mission Constraints	Saturn Orbit Number	CASSINIrevnoint

Category	Label Units	Field ID
Cassini Mission Constraints	Primary Instrument	CASSINIprimeinst
Cassini Mission Constraints	Is Prime	CASSINIisprime
Cassini Mission Constraints	Sequence ID	CASSINIsequenceid
Cassini Mission Constraints	Spacecraft Clock Start Count	CASSINIspacecraftclockcount1
Cassini Mission Constraints	Spacecraft Clock Stop Count	CASSINIspacecraftclockcount2
Cassini Mission Constraints	Earth Received Start Time	CASSINIert1
Cassini Mission Constraints	Earth Received Stop Time	CASSINIert2
Galileo Mission Constraints	Orbit Number	GALILEOrbitnumber
Galileo Mission Constraints	Spacecraft Clock Start Count	GALILEOspacecraftclockcount1
Galileo Mission Constraints	Spacecraft Clock Stop Count	GALILEOspacecraftclockcount2
Hubble Mission Constraints	Detector	HSTdetector
Hubble Mission Constraints	Filter Name	HSTfilter
Hubble Mission Constraints	Filter Type	HSTfiltertype
Hubble Mission Constraints	STIS Optical Element	HSTopticalelement
Hubble Mission Constraints	Aperture Type	HSTaperturetype
Hubble Mission Constraints	STIS Proposed Aperture Type	HSTproposedaperturetype
Hubble Mission Constraints	HST Proposal ID	HSTproposalid
Hubble Mission Constraints	PI Name	HSTpiname
Hubble Mission Constraints	STScI File Name	HSTstscigroupid
Hubble Mission Constraints	HST Target Name	HSTtargetname
Hubble Mission Constraints	WFPC2 Targeted Detector	HSTtargeteddetecter
Hubble Mission Constraints	WFPC2 PC1 Flag	HSTpc1flag
Hubble Mission Constraints	WFPC2 WF2 Flag	HSTwf2flag
Hubble Mission Constraints	WFPC2 WF3 Flag	HSTwf3flag
Hubble Mission Constraints	WFPC2 WF4 Flag	HSTwf4flag
Hubble Mission Constraints	Exposure Type	HSTexposuretype
Hubble Mission Constraints	Fine Guidance System Lock	HSTfineguidancesystemlocktype
Hubble Mission Constraints	Gain Mode	HSTgainmode

Category	Label Units	Field ID
Hubble Mission Constraints	Instrument Mode	HSTinstrumentmode
Hubble Mission Constraints	Publication Date	HSTpublicationdate
New Horizons Mission Constraints	Mission Phase	NEWHORIZONSmissionphase
New Horizons Mission Constraints	Spacecraft Clock Start Count	NEWHORIZONSspacecraftclockcount1
New Horizons Mission Constraints	Spacecraft Clock Stop Count	NEWHORIZONSspacecraftclockcount2
Voyager Mission Constraints	Mission Phase	VOYAGERmissionphasename
Voyager Mission Constraints	Spacecraft Clock Start Count	VOYAGERspacecraftclockcount1
Voyager Mission Constraints	Spacecraft Clock Stop Count	VOYAGERspacecraftclockcount2
Voyager Mission Constraints	Earth Received Time	VOYAGERert
Cassini CIRS Constraints	Detector ID	COCIRSdetectorid
Cassini CIRS Constraints	Blinking Mode	COCIRSinstrumentmodeblinkingflag
Cassini CIRS Constraints	Even Mode	COCIRSinstrumentmodeevenflag
Cassini CIRS Constraints	Odd Mode	COCIRSinstrumentmodeoddflag
Cassini CIRS Constraints	Centers Mode	COCIRSinstrumentmodecentersflag
Cassini CIRS Constraints	Pairs Mode	COCIRSinstrumentmodepairsflag
Cassini CIRS Constraints	All Mode	COCIRSinstrumentmodeallflag
Cassini ISS Constraints	Camera	COISScamera
Cassini ISS Constraints	Filter	COISSfilter
Cassini ISS Constraints	Shutter Mode	COISSshuttermode
Cassini ISS Constraints	Shutter State	COISSshutterstate
Cassini ISS Constraints	Compression Type	COISScompressiontype
Cassini ISS Constraints	Data Conversion Type	COISSdataconversiontype
Cassini ISS Constraints	Gain Mode	COISSgainmode
Cassini ISS Constraints	Instrument Mode	COISSinstrumentmode
Cassini ISS Constraints	Missing Lines	COISSmissinglines
Cassini ISS Constraints	Image Number	COISSimagenumber
Cassini ISS Constraints	Target Description	COISStargetdesc
Cassini ISS Constraints	Image Observation Type	COISSimageobservationtype
Cassini UVIS Constraints	Detector	COUVISchannel
Cassini UVIS Constraints	Observation Type	COUVISobservationtype
Cassini UVIS Constraints	Occultation Port State	COUVISoccultationportstate
Cassini UVIS Constraints	Slit State	COUVISSlitstate
Cassini UVIS Constraints	Line (Min)	COUVISline1

Category	Label Units	Field ID
Cassini UVIS Constraints	Line (Max)	COUVISline2
Cassini UVIS Constraints	Line Binning	COUVISlinebin
Cassini UVIS Constraints	Band (Min)	COUVISband1
Cassini UVIS Constraints	Band (Max)	COUVISband2
Cassini UVIS Constraints	Band Binning	COUVISbandbin
Cassini UVIS Constraints	Samples	COUVISsamples
Cassini UVIS Constraints	Compression Type	COUVIScompressiontype
Cassini UVIS Constraints	Integration Duration seconds, milliseconds, minutes, hours, days	COUVISintegrationduration
Cassini UVIS Constraints	HDAC Dwell Time	COUVISdwelltime
Cassini UVIS Constraints	Test Pulse State	COUVIStestpulsestate
Cassini VIMS Constraints	Channel	COVIMSchannel
Cassini VIMS Constraints	VIS Sampling Mode	COVIMSVISSAMPLINGMODE
Cassini VIMS Constraints	VIS Exposure seconds, milliseconds, minutes, hours, days	COVIMSVISEXPOSURE
Cassini VIMS Constraints	IR Sampling Mode	COVIMSIRESAMPLINGMODE
Cassini VIMS Constraints	IR Exposure seconds, milliseconds, minutes, hours, days	COVIMSIREXPOSURE
Cassini VIMS Constraints	Swath Width	COVIMSSWATHWIDTH
Cassini VIMS Constraints	Swath Length	COVIMSSWATHLENGTH
Cassini VIMS Constraints	Spectral Summing	COVIMSSPECTRALSUMMING
Cassini VIMS Constraints	Spectral Editing	COVIMSSPECTRALEDITING
Cassini VIMS Constraints	Instrument Mode	COVIMSinstrumentmode
Cassini VIMS Constraints	Star Tracking	COVIMSSSTARTRACKING
Galileo SSI Constraints	Filter Name	GOSSIFILTER
Galileo SSI Constraints	Filter Number	GOSSIFILTERNUMBER
Galileo SSI Constraints	Compression Type	GOSSICompressiontype
Galileo SSI Constraints	Gain Mode	GOSSIGAINMODE
Galileo SSI Constraints	Obstruction	GOSSIOBSTRUCTION
Galileo SSI Constraints	Frame Duration	GOSSIFRAMEDURATION
Galileo SSI Constraints	Image ID	GOSSIIIMAGEID
Galileo SSI Constraints	Observation ID	GOSSIOBSERVATIONID
New Horizons LORRI Constraints	Binning Mode	NHLORRIBINNINGMODE

Category	Label Units	Field ID
New Horizons LORRI Constraints	Instrument Compression Type	NHLORRIinstrumentcompressiontype
New Horizons MVIC Constraints	Instrument Compression Type	NHVMVICinstrumentcompressiontype
Voyager ISS Constraints	Camera	VGISScamera
Voyager ISS Constraints	Filter Name	VGISSfilter
Voyager ISS Constraints	Filter Number	VGISSfilternumber
Voyager ISS Constraints	Shutter Mode	VGISSshuttermode
Voyager ISS Constraints	Edit Mode	VGISSeditmode
Voyager ISS Constraints	Gain Mode	VGISSgainmode
Voyager ISS Constraints	Scan Mode	VGISSscanmode
Voyager ISS Constraints	Image ID	VGISSimageid
Voyager ISS Constraints	Usable Lines	VGISSusablelines
Voyager ISS Constraints	Usable Samples	VGISSusablesamples