



EOSDIS

NASA'S EARTH OBSERVING SYSTEM
DATA AND INFORMATION SYSTEM

End-to-End Solution for Data Customization with NASA's Earthdata Search

2018 AGU Fall Meeting

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The Challenge

- “there is very little consistency of the tools available to perform subsetting, and there is very little consistency with services across the DAACs.”¹

¹CMR End-to-End Services Study, 2016

The Challenge

- September of 2016, of over 90 interview subjects, a prevailing issue was that regardless of their experience level, they all had difficulty in finding the right data set and preparing the data to get it in the desired format.

“Perfection is achieved, not when there is nothing left to add, but when there is nothing left to take away.” – A. de Saint-Exupery

THE VISION

The Vision

- User is required to provide a minimum of input for service invocation.
- Optimization for the majority of the user population, not the totality.
- Use the user's jargon, i.e. options not services; files not granules.

"No one can whistle a symphony. It takes a whole orchestra to play it." – H.E. Luccock

THE PIECES

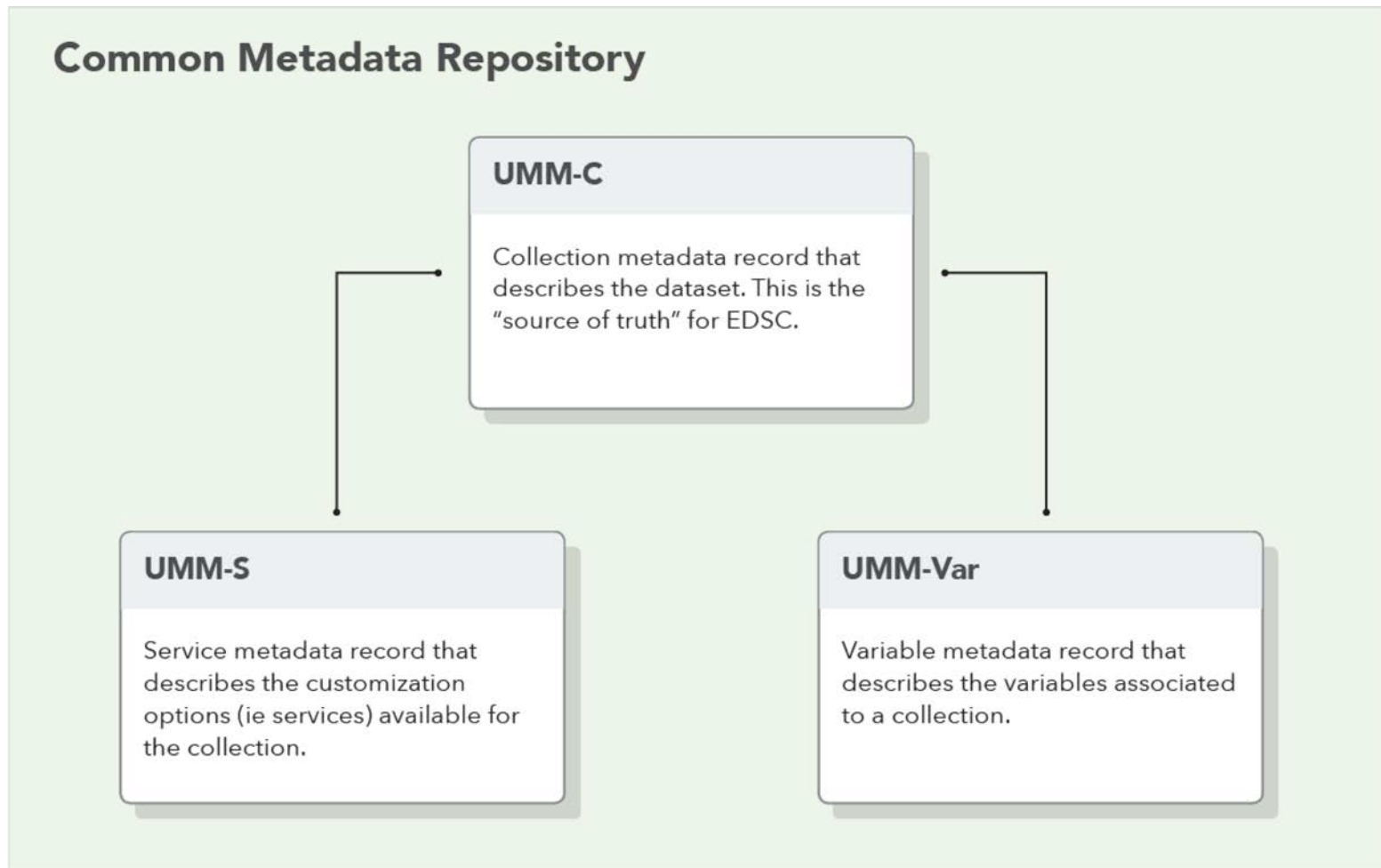
The Pieces

- “If you wait until the last minute to complete the user interface, it only takes a minute.” -Anonymous

The Pieces

- User Experience Driven Design (UXDD)
 - Start with the end in mind
 - Consider users over architecture and current capabilities
 - Favor simplicity above all

The Pieces



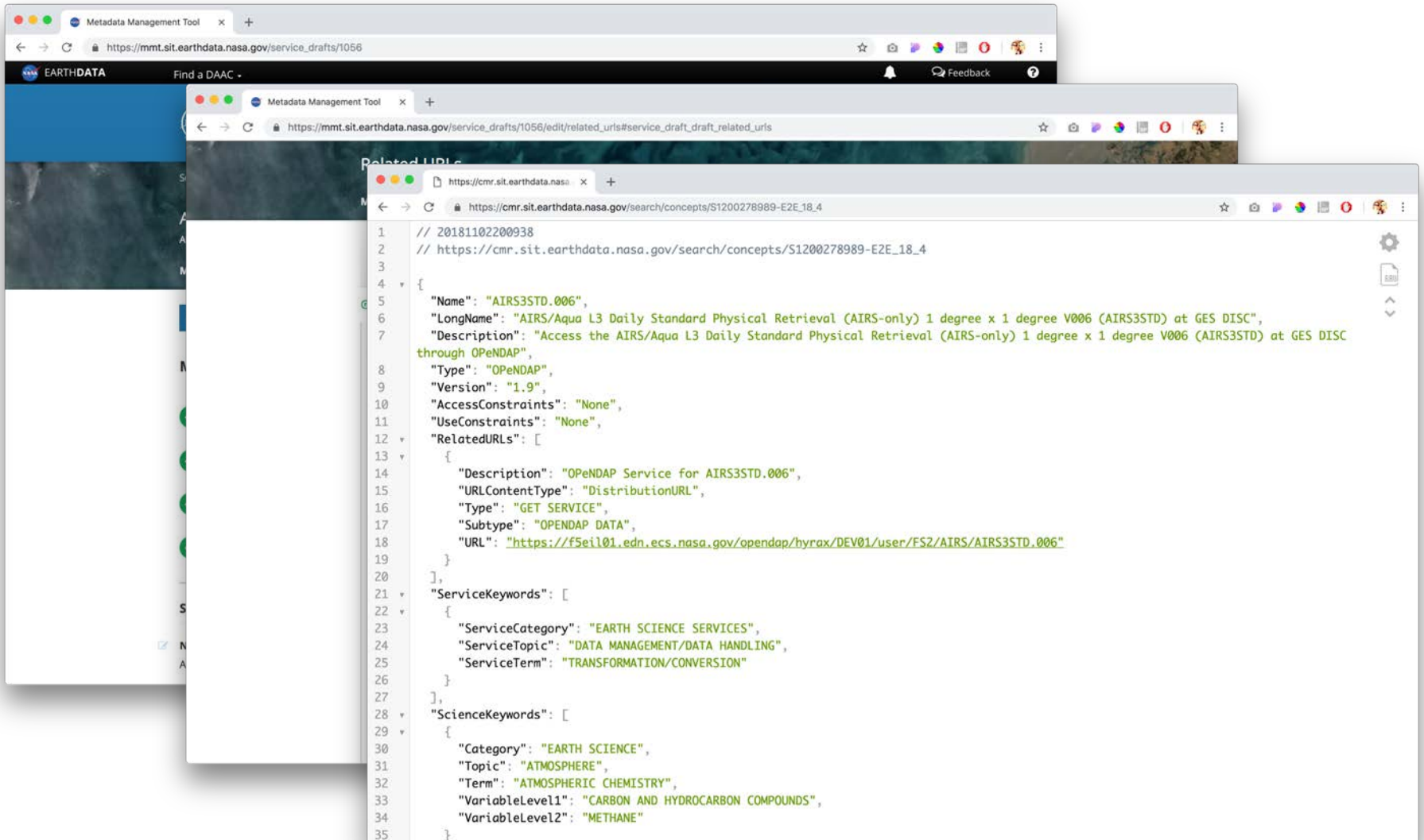
The Pieces

- UMM-Var
 - Answers the question “What measurement and variables are available within this collection?”
 - Can be auto-generated!

The Pieces

- UMM-S
 - Answers the question “What can I do with this collection?”
 - What formats can I output this data to?
 - Can I reproject this data?
 - Does this collection support spatial subsetting?

The Pieces



The image shows a stack of three browser windows from the NASA Earthdata Metadata Management Tool. The top window displays a search result for a concept. The middle window shows the 'Related URLs' section. The bottom window displays the full JSON metadata record for the service.

```
1 // Z0181102200938
2 // https://cmr.sit.earthdata.nasa.gov/search/concepts/S1200278989-E2E_18_4
3
4 {
5   "Name": "AIRS3STD.006",
6   "LongName": "AIRS/Aqua L3 Daily Standard Physical Retrieval (AIRS-only) 1 degree x 1 degree V006 (AIRS3STD) at GES DISC",
7   "Description": "Access the AIRS/Aqua L3 Daily Standard Physical Retrieval (AIRS-only) 1 degree x 1 degree V006 (AIRS3STD) at GES DISC
8   through OPeNDAP",
9   "Type": "OPeNDAP",
10  "Version": "1.9",
11  "AccessConstraints": "None",
12  "UseConstraints": "None",
13  "RelatedURLs": [
14    {
15      "Description": "OPeNDAP Service for AIRS3STD.006",
16      "URLContentType": "DistributionURL",
17      "Type": "GET SERVICE",
18      "Subtype": "OPENDAP DATA",
19      "URL": "https://f5e1l01.edn.ecs.nasa.gov/opepdap/hyrax/DEV01/user/FS2/AIRS/AIRS3STD.006"
20    }
21  ],
22  "ServiceKeywords": [
23    {
24      "ServiceCategory": "EARTH SCIENCE SERVICES",
25      "ServiceTopic": "DATA MANAGEMENT/DATA HANDLING",
26      "ServiceTerm": "TRANSFORMATION/CONVERSION"
27    }
28  ],
29  "ScienceKeywords": [
30    {
31      "Category": "EARTH SCIENCE",
32      "Topic": "ATMOSPHERE",
33      "Term": "ATMOSPHERIC CHEMISTRY",
34      "VariableLevel1": "CARBON AND HYDROCARBON COMPOUNDS",
35      "VariableLevel2": "METHANE"
36    }
37  ]
38 }
```

The Pieces

- CMR Magic

```
1 {
2   "boxes": [
3     "-90 -180 90 180"
4   ],
5   "time_start": "2002-08-30T00:00:00.000Z",
6   "version_id": "006",
7   "updated": "2014-12-18T00:00:00.000Z",
8   "dataset_id": "Aqua AIRS Level 3 Daily Standard Physical Retrieval (AIRS+AMSU) V006 (AIRX3STD) at GES DISC",
9   "has_spatial_subsetting": true,
10  "has_transforms": true,
11  "associations": {
12    "variables": [
13      "V1200265916-EDF_OPS",
14      "V1200266510-EDF_OPS",
15      "V1200266548-EDF_OPS"
16    ],
17    "services": [
18      "S1200245793-EDF_OPS"
19    ]
20  },
21  "has_variables": true,
22  "data_center": "EDF_OPS",
23  "short_name": "AIRX3STD"
24 }
```

The Pieces

- CMR Magic

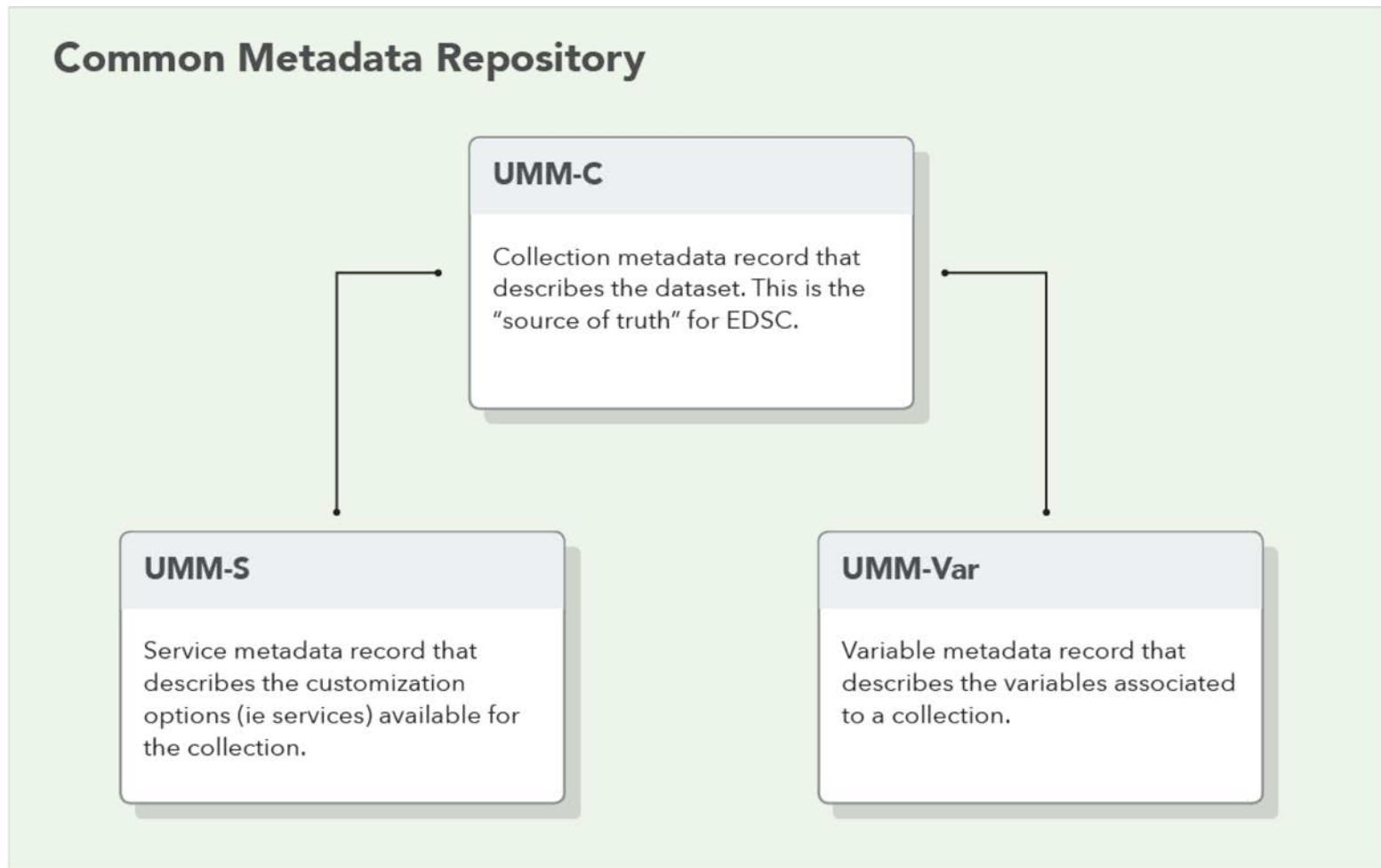
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1 {
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4   ],
5   "time_start": "2002-08-30T00:00:00.000Z",
6   "version_id": "006",
7   "updated": "2014-12-18T00:00:00.000Z",
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17    "services": [
18      "S1200245793-EDF_OPS"
19    ]
20  },
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22  "data_center": "EDF_OPS",
23  "short_name": "AIRX3STD"
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The Pieces

- CMR Magic

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15      "V1200266548-EDF_OPS"
16    ],
17    "services": [
18      "S1200245793-EDF_OPS"
19    ]
20  },
21  "has_variables": true,
22  "data_center": "EDF_OPS",
23  "short_name": "AIRX3STD"
24 }
```

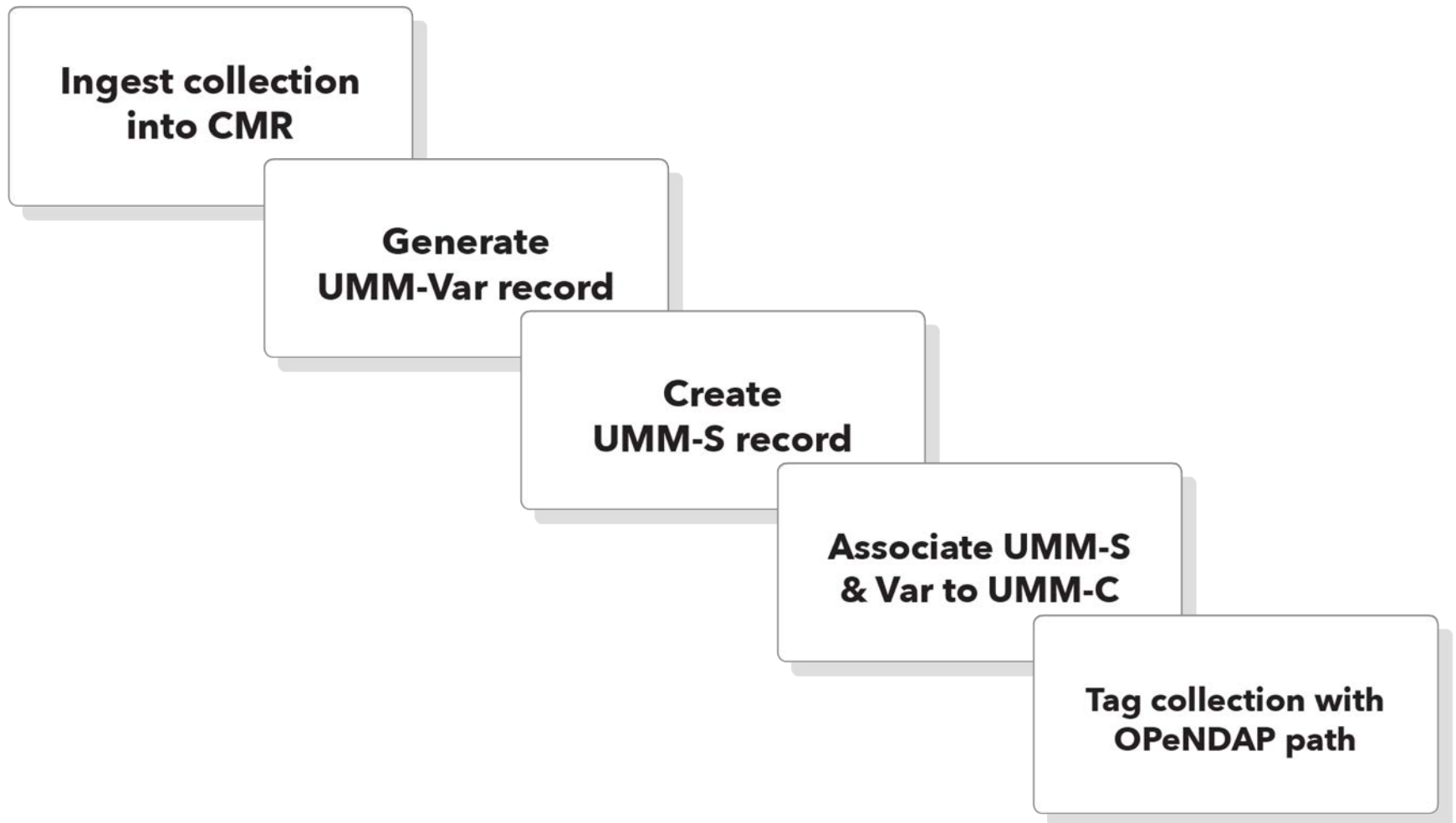
The Pieces



“Data is a precious thing and will last longer than the systems themselves.” – Tim Berners-Lee

THE PROVIDER WORKFLOW

The Provider Workflow



“And I knew exactly what to do. But in a much more real sense, I had no idea what to do.” - Michael Scott

THE USER WORKFLOW

Search and Add to Project

The screenshot displays the Earthdata Search web application. The search query is "aqua airs" with a start time of 2015-12-31 06:00:50 and a stop time of 2018-12-29 15:17:20. The search area is defined by a rectangle with SW coordinates 18.6328125, -91.195312 and NE coordinates 22.1484375, -85.78125. The map shows the Gulf of Mexico and surrounding landmasses. The search results section shows 97 matching collections, sorted by Relevance. The first result is "Aqua AIRS Level 3 Daily Standard Physical Retrieval (AIRS+AMSU) V006 (AIRX3STD) at GES DISC", which has a red circle around its "Add to Project" button. The second result is "AIRS/Aqua L3 8-day Standard Physical Retrieval (AIRS-only) 1 degree X 1 degree V006 (AIRS3ST8) at GES DISC V006". The third result is "Aqua AIRS Level 3 Daily Standard Physical Retrieval (AIRS+AMSU) V006 (AIRX3STD) at GES DISC [Testing Variable Dimensions]".

Customize Output

The screenshot shows the Earthdata Search web application interface. The browser address bar indicates the URL: <https://searchlab.earthdata.nasa.gov/search/collections?projectId=4009334615>. The page title is "AGU 2018". The search results summary shows "2 Granules", "2 Collections", and "286.7 TB".

On the left sidebar, there is a "Variables" section with the variable "C1200268801-EDF_DEV01 analysed sea surface temperature". Below it are sections for "Transformations" and "Output Formats". A green "DOWNLOAD DATA" button is at the bottom of the sidebar.

The main content area displays two granules:

- Granule 1:** "AIRS/Aqua L3 Daily Standard Physical Retrieval (AIRS-only) 1 degree x 1 degree V006 (AIRS3STD) at GES ...". It shows "1 Granules" and an "Estimated Size: 286.7 TB". A red circle highlights the "Edit Options" button below this granule.
- Granule 2:** "GHRSSST Level 4 MUR Global Foundation Sea Surface Temperature Analysis (v4.1) V001". It shows "1 Granules" and an "Estimated Size: 368.0 MB". It also has an "Edit Options" button.

At the bottom of the page, there is a footer with version information "v e2e-services-18.4.3.1", search time, NASA Official information, and a link to "Earthdata Access, A Section 508 accessible alternative".

Customize Output

The screenshot shows a web browser window with the URL <https://searchlab.earthdata.nasa.gov/search/collections?projectId=4009334615>. The page title is "AGU 2018". A modal dialog box titled "Edit Options" is open, containing the following sections:

- Delivery Method**
 - Customize & Download (OPeNDAP)**

Select options like variables, transformations, and output formats to customize your data. The desired data files will be made available for access immediately. Files will be accessed from a list of links in the browser or by using a download script.

[Edit Delivery Method](#)
- Additional Options**
 - Variable Selection**

Use science keywords to subset your collection granules by measurements and variables.
No variables selected. All variables will be included in download.

[Edit Variables](#)
 - Spatial subsetting is inherited from your search session. [Click here](#) to modify.

At the bottom right of the dialog is a "Close" button. In the background, the left sidebar shows a map with a "Rectangle" selection, and sections for "Variables" (C1200268801-EDF_DEV01 analysed sea surface temperature), "Transformations", and "Output Formats". A "DOWNLOAD DATA" button is visible at the bottom of the sidebar.

Customize Output

The screenshot shows the Earthdata Search web application interface. A modal dialog titled "Edit Variables" is open, displaying a list of variables for selection. The "EMISSIVITY" variable is circled in red. The background interface shows a map of a region, a sidebar with navigation options like "Variables", "Transformations", and "Output Formats", and a "DOWNLOAD DATA" button. The browser address bar shows the URL: <https://searchlab.earthdata.nasa.gov/search/collections?projectId=4009334615>.

Edit Variables

Back to Edit Options

Variable Selection

- SURFACE PRESSURE
- AIR TEMPERATURE
- SKIN TEMPERATURE
- EMISSIVITY**
- TROPOPOUSE
- UPPER AIR TEMPERATURE
- TOTAL PRECIPITABLE WATER
- WATER VAPOR
- CLOUD HEIGHT
- CLOUD TOP PRESSURE
- CLOUD TOP TEMPERATURE

Done

Customize Output

The screenshot displays the NASA Earthdata Search web application. A modal dialog titled "Edit Variables" is open, allowing for variable selection. The dialog includes a "Back to Edit Options" link and a "Variable Selection" section. Under "Variable Selection", there are two radio buttons: "ALL LEAFNODES" (selected) and "EMISSIVITY". Below this, several variables are listed with checkboxes and "View Details" links:

- Select All Variables
- EmisIR_A_err
Emissivity IR Ascending Standard Error | [View Details](#)
- EmisIR_A
Emissivity IR Ascending | [View Details](#)
- EmisIR_A_max
Emissivity IR Ascending Maximum | [View Details](#)
- TotalCounts_A
TotalCounts Ascending | [View Details](#)
- EmisIR_A_ct
Emissivity IR Ascending Input Count | [View Details](#)
- EmisIR_A_min

At the bottom of the dialog are "Back" and "Save" buttons. The background interface shows a search for "AGU 2018" with a map and a list of variables under "Variables":

- C1200278968-E2E_18_4
Emissivity IR Ascending Maximum
- C1200268901-EDF_DEV01
analysed sea surface temperature

Other interface elements include "Transformations" and "Output Formats" sections, a "DOWNLOAD DATA" button, and a footer with version information and accessibility links.

Customize Output

The screenshot displays the Earthdata Search Lab interface. A modal dialog titled "Edit Variables" is open, allowing users to select variables for their search. The dialog includes a "Back to Edit Options" button and a "Done" button. The "Variable Selection" section lists the following variables:

- SURFACE PRESSURE
- AIR TEMPERATURE
- SKIN TEMPERATURE
- EMISSIVITY (1 selected)
- TROPOPAUSE
- UPPER AIR TEMPERATURE
- TOTAL PRECIPITABLE WATER
- WATER VAPOR
- CLOUD HEIGHT
- CLOUD TOP PRESSURE
- CLOUD TOP TEMPERATURE

The background interface shows a map of a region with a "Rectangle" tool, a sidebar with "Variables" and "Transformations" sections, and a "DOWNLOAD DATA" button. The top navigation bar includes the Earthdata logo and a search bar.

Confirm Output

The screenshot shows the Earthdata Search web application. The browser address bar indicates the URL: https://searchlab.earthdata.nasa.gov/search/collections?p=IC1200278968-E2E_18_4IC120026.... The page header includes the NASA Earthdata logo and the text "Find a DAAC". The main content area displays search results for "AGU 2018". It shows a summary of "2 Granules", "2 Collections", and "286.7 TB" of data. Two granules are listed in detail:

- Granule 1:** AIRS/Aqua L3 Daily Standard Physical Retrieval (AIRS-only) 1 degree x 1 degree V006 (AIRS3STD) at GES ...
 - 1 Granules
 - Estimated Size: 286.7 TB
 - View Granules
 - Edit Options
- Granule 2:** GHRSSST Level 4 MUR Global Foundation Sea Surface Temperature Analysis (v4.1) V001
 - 1 Granules
 - Estimated Size: 368.0 MB
 - View Granules
 - Edit Options

On the left sidebar, there is a map showing a rectangular selection over a satellite image of a coastal region. Below the map are sections for "Variables" (listing C1200278968-E2E_18_4 and C1200268801-EDF_DEV01) and "Transformations/Output Formats". At the bottom left of the main content area, a green button with a download icon and the text "DOWNLOAD DATA" is circled in red.

Download Data

Order Status

This page will automatically update as your orders are processed. The Order Status page can be accessed later by visiting <https://searchlab.earthdata.nasa.gov/data/retrieve/9608525453> or the [Download Status and History](#) page.

Direct Download

Click the "View/Download Data Links" button to view or download a file containing links to your data.

AIRS/Aqua L3 Daily Standard Physical Retrieval (AIRS-only) 1 degree x 1 degree V006 (AIRS3STD) at GES DISC

[View/Download Data Links](#) [Download Access Script](#)

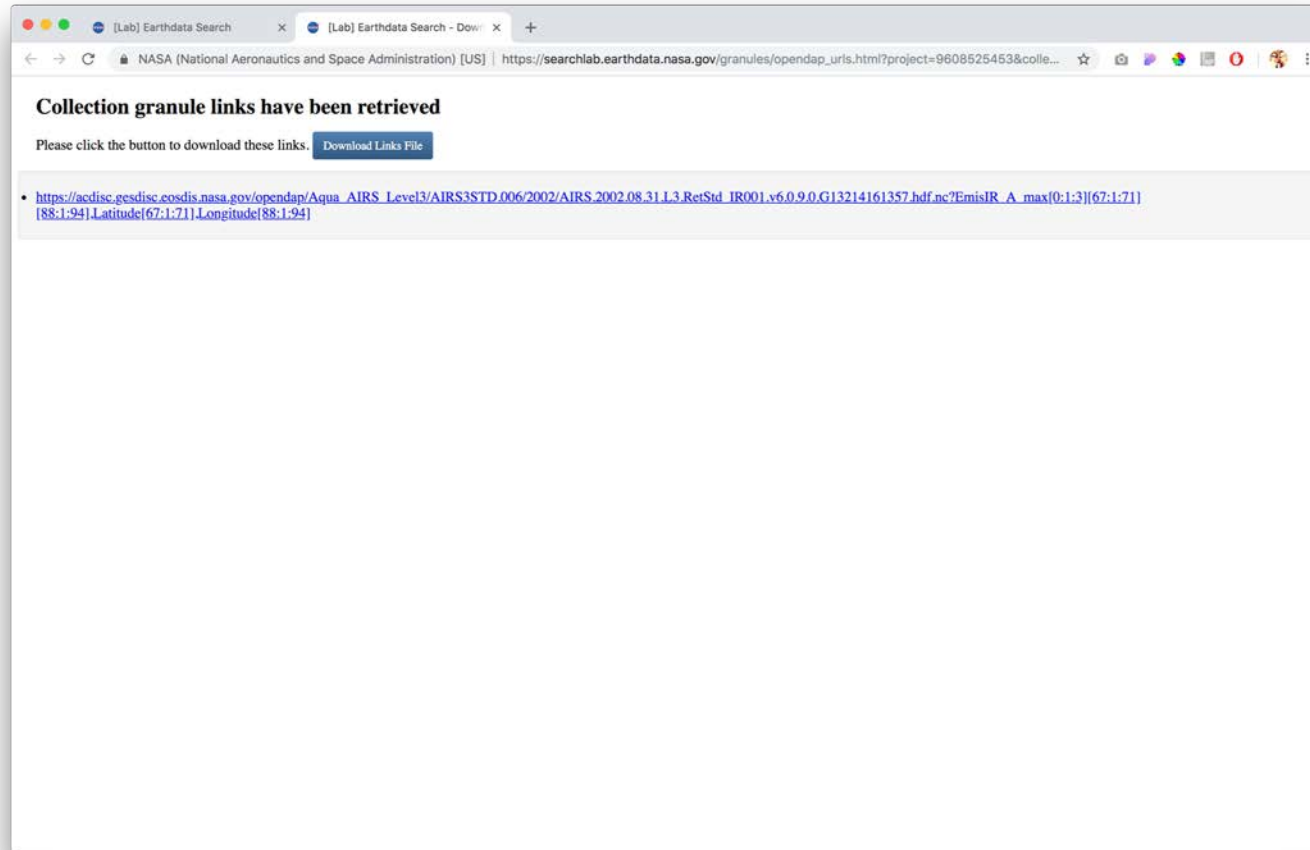
GHRSSST Level 4 MUR Global Foundation Sea Surface Temperature Analysis (v4.1) V001

[View/Download Data Links](#) [Download Access Script](#)

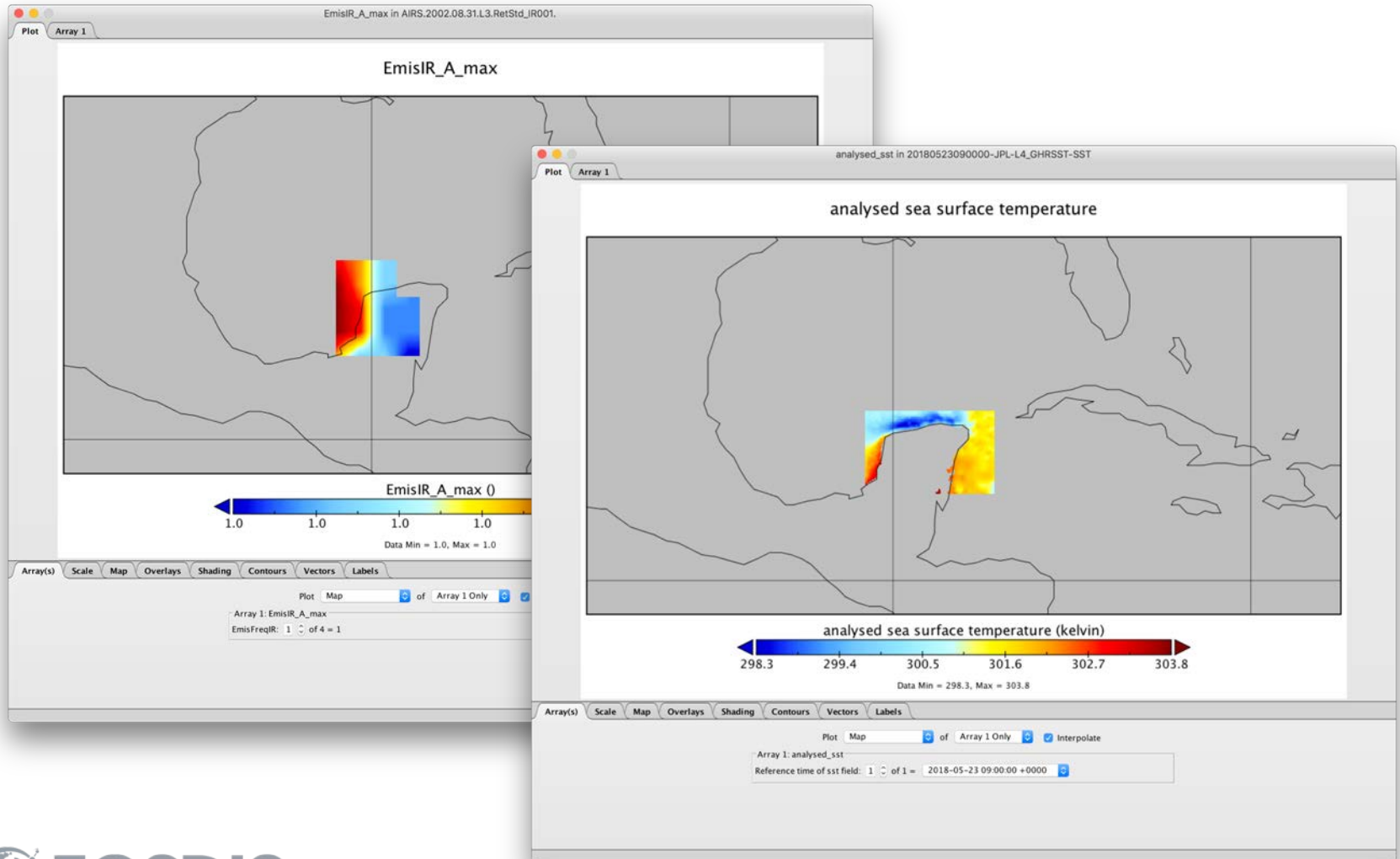
Additional Resources and Documentation

- **GHRSSST Level 4 MUR Global Foundation Sea Surface Temperature Analysis (v4.1) V001**
ftp://podaac.jpl.nasa.gov/allData/ghrsst/sw/generic_nc_readers/matlab/
[https://podaac-tools.jpl.nasa.gov/soto/#b=BlueMarble_ShadedRelief_Bathymetry&i=GHRSSST_L4_MUR_Sea_Surface_Temperature\(la=true\)](https://podaac-tools.jpl.nasa.gov/soto/#b=BlueMarble_ShadedRelief_Bathymetry&i=GHRSSST_L4_MUR_Sea_Surface_Temperature(la=true))
<https://podaac-uat.jpl.nasa.gov/las/UI.vm>
<https://podaac.jpl.nasa.gov/forum/viewtopic.php?f=5&t=219>
ftp://podaac.jpl.nasa.gov/allData/ghrsst/sw/generic_nc_readers/idl/
ftp://podaac.jpl.nasa.gov/allData/ghrsst/sw/generic_nc_readers/R/
ftp://podaac.jpl.nasa.gov/allData/ghrsst/sw/generic_nc_readers/python/

Download Data



Science!



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