



ARD Services for ECV Data in CEOS WGISS Carbon Community Portal

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Executive Summary



- Essential Climate Variables (ECV) are key data sets for climate change studies
- Analysis-ready Data (ARD) is the data products that have been processed to a minimum set of requirements and organized into a form that allows **immediate analysis** with a minimum of additional user effort and interoperability both through time and with other datasets (defined by CEOS).
 - Immediate analysis requires that data obtained by the data users exactly matches users' specification in the format, projection, spatial/temporal coverage and resolution, and parameters so that it can be ingested into user's analysis system immediately without further efforts.
 - Since individual data users and projects have different requirements, personalized services for customizing the data must be provided in order to meet the requirement of immediate analysis, which we call ARD services.
 - Most of ECV data provides don't provide such service
- CEOS WGISS is a WGISS data portal for providing data discovery and access services to Carbon science community. All ECV datasets are accessible through the portal
- ARD services have been prototyped for the ECV datasets discoverable and accessible through the portal

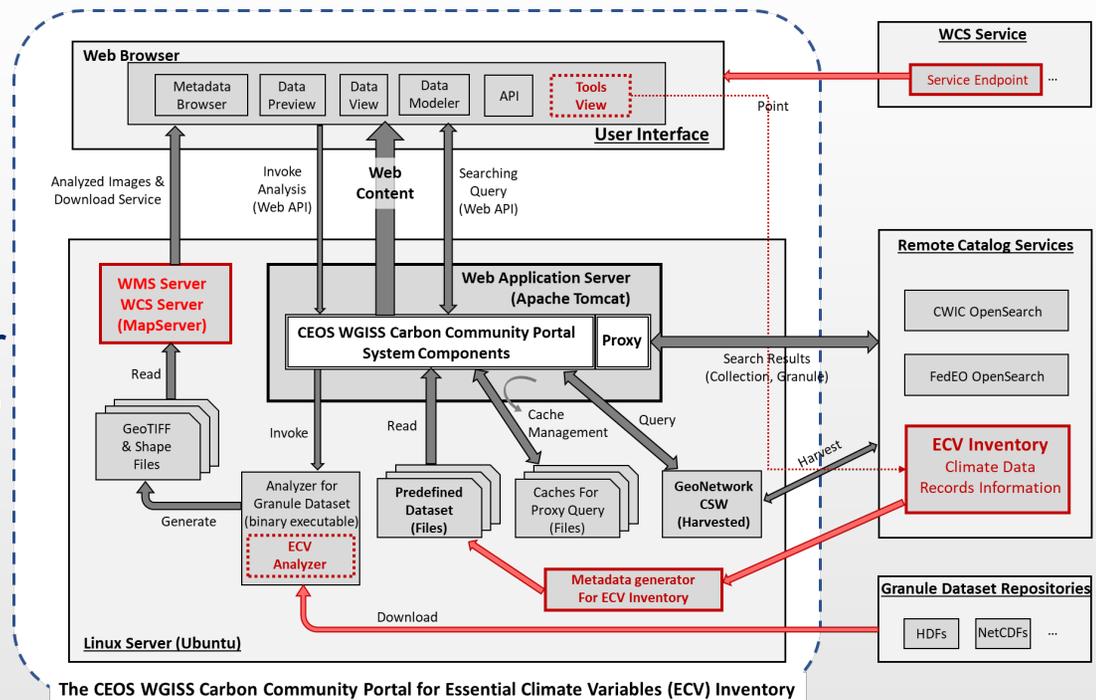


Approach



- OGC Web Coverage Service (WCS) is the standard selected as the interface specification for delivering ARD services
 - WCS specification allows clients to specify the format, projection, spatial/temporal coverage and resolution etc for the requested data
- The Carbon Portal conducted data discovery and access in two steps:
 - step 1: Data collection search and step 2: granule search to search granules in the collection
 - ARD services are enabled on results of granule search if the collection is an ECV
- If the ECV data provider has implemented the WCS service for the dataset, the portal will directly communicate with ECV provider's WCS server for ARD service
- If the ECV data provider does not have the WCS service, the portal's server will download entire granule and stage it on the portal server to provide ARD service

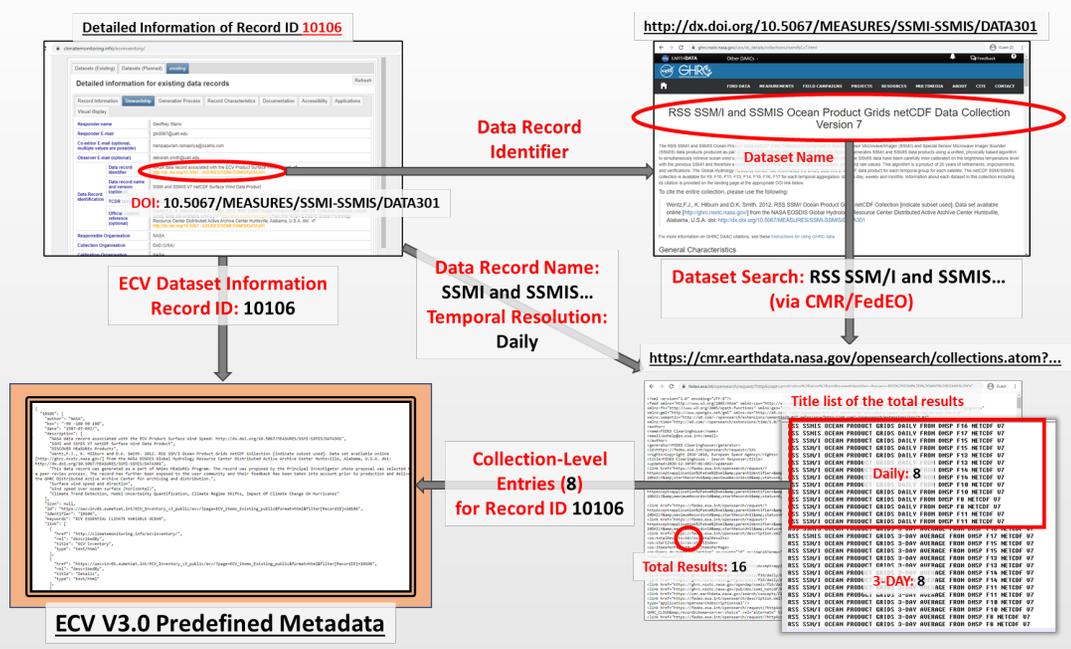
- Progress
 - Revised Architecture
 - ECV Inventory v3.0 records are converted as a unified form of the portal predefined metadata format by a converting tool
 - Retrieve collection metadata for ECV entries from CWIC/FedEO OpenSearch referred by Data Record Information





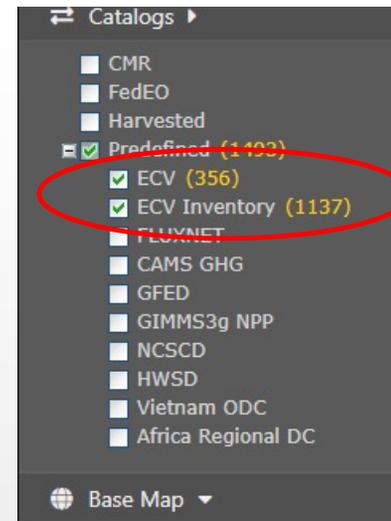
Discovery and Access of ECVs through the CEOS WGISS Carbon Community

- Progress
 - Creating ECV relative collection entries from ECV v3.0 Inventory records
 - o Each “Existing” ECV records have Data Record Identification
 - o A tool checks if the Data Record exists a collection-level search result of CMR/FedEO OpenSearch
 - o If exists, the collection entry keeps as a predefined metadata entry

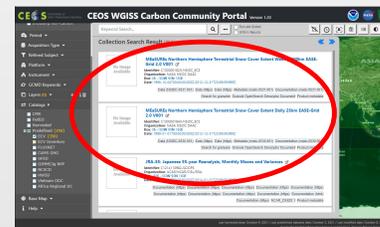




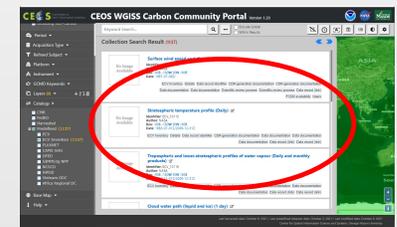
- Progress
 - Function improvement – ECV Inventory Connectivity
 - Add predefined metadata based on ECV Inventory v3.0
 - Generated by a tool
 - List 1137 ECV inventory records (Same as WGClimate, 766 for Existing, 371 for Planned)
 - Added totally 356 predefined ECV relative collection datasets from ECV Records



ECV Collection Entries (356)
ECV Inventory (1137)



356 Collection Entries related to ECV



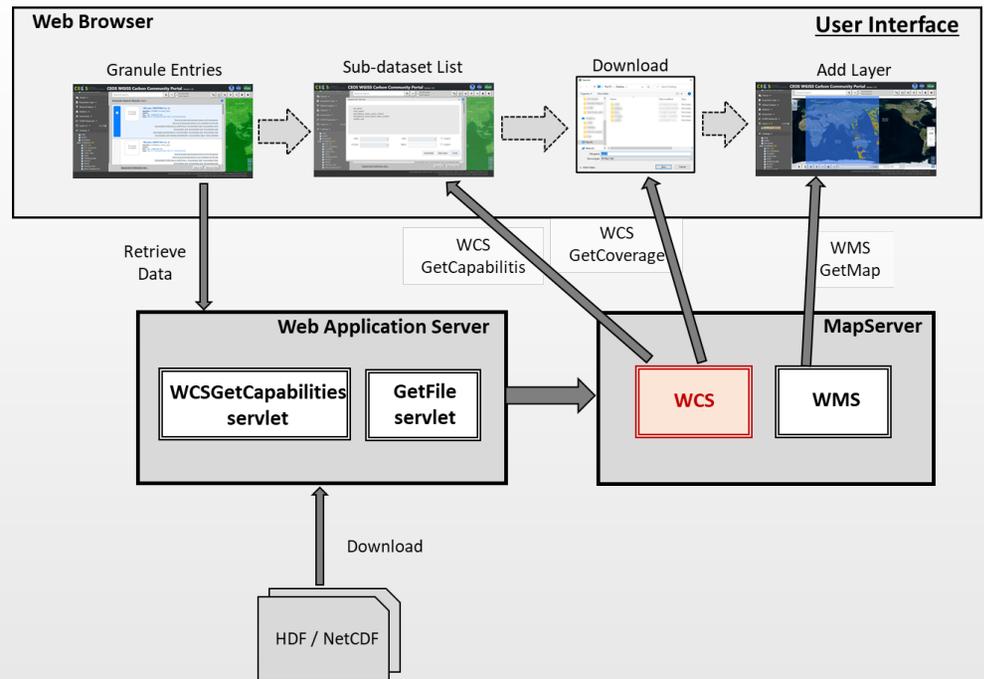
1137 ECV Record ID in ECV Inventory



Function Improvement: WCS backend



- ARD service for ECVs in case that providers have no WCS services
 - Support when user select one granule entry
 - Download granule dataset file from given repository, and manipulate it for serving WCS
 - Stage the data in portal backend server and generate a list of all coverages in the granule
 - User specifies the specifications of data to download
 - User obtains the customized data by downloading via WCS GetCoverage request
- ARD service for ECVs with data providers' WCS
 - Directly talk to provider's WCS
 - Without granule downloading and stage steps in the portal's backend server.





Analysis Ready Data Search for ECV (Demo, Granule Downloading)



- Demo
 - Keyword: surface wind speed
 - Filter: daily
 - Date: 10/1/2021 – 10/3/2021
- Step 1 – set Keyword and Filters
 - Enable category: ECV category
 - Type Keyword: surface wind speed
 - Enable Filter: daily
 - Result: 35 total collection entries

The screenshot shows the CEOS WGISS Carbon Community Search interface. The search results are displayed as a list of collection entries. The search criteria are: Keyword: surface wind speed, Filter: Daily (35), Date: 10/1/2021 – 10/3/2021. The results list includes entries such as "Satellite-Based Surface Turbulent Fluxes, 0.25 x 0.25 deg, Daily Grid V3" and "AVHRR Pathfinder version 5.2 level 3 collated (L3C) global 4km sea surface temperature for 1981-2012". The interface also shows a sidebar with filters for Period (Yearly, Monthly, Weekly, Daily (35), Hourly), Acquisition Type, Refined Subject, Platform, Instrument, GCMD Keywords, Layers (0), and Catalogs (CMR (3), FedEO (0), Harvested, Predefined (32), ECV (32), ECV Inventory, FLUXNET, CAMS GHG). The search results are displayed in a table with columns for Data, Documentation, and Product metadata.

Analysis Ready Data Search for ECV (Demo, Granule Downloading)



- Step 2 – set Temporal Constraint
 - Click Temporal Constraint icon in Toolbar
 - Set both start and end date to 10/1/2021
 - Click Apply button
 - Result: 9 total collection entries

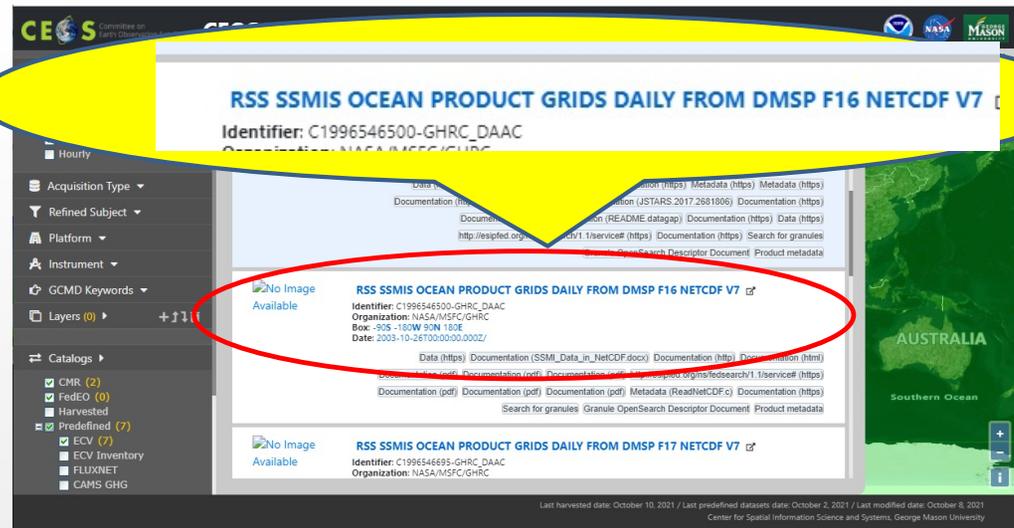


The screenshot shows the CEOS Data Search Portal interface. The left sidebar contains filters for Period, Acquisition Type, Refined Subject, Platform, Instrument, GCMD Keywords, Layers, and Catalogs. The main panel displays search results for 'ECV' with 32 predefined entries. The 'Temporal Range (UTC)' section is highlighted with a red circle, showing 'Start: 10/01/2021 00:00' and 'End: 10/01/2021 23:59'. A yellow callout box highlights the 'Start' and 'End' input fields, and another yellow callout box highlights the 'Apply' button. A third yellow callout box highlights the 'Apply' button at the bottom of the search results area.

Analysis Ready Data Search for ECV (Demo, Granule Downloading)



- Step 3 – Select a Collection Entry and get granule entries
 - Scroll down and click the title, “RSS SSMIS OCEAN PRODUCT GRIDS DAILY FROM DMSP F16 NETCDF V7” entry
 - Results: 1 granule entry



RSS SSMIS OCEAN PRODUCT GRIDS DAILY FROM DMSP F16 NETCDF V7
 Identifier: C1996546500-GHRC_DAAC
 Organization: NASA/MSC/GHRC

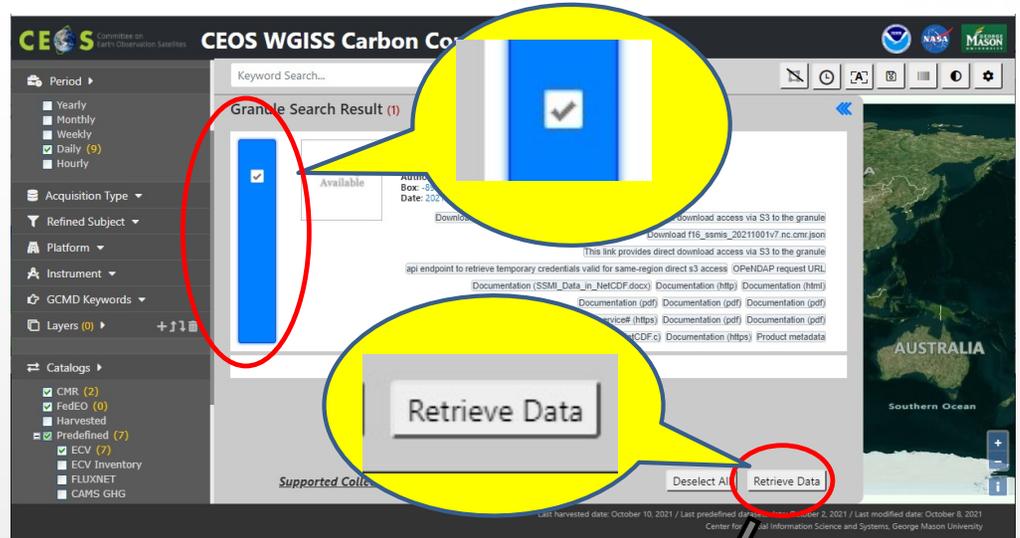
No Image Available
RSS SSMIS OCEAN PRODUCT GRIDS DAILY FROM DMSP F16 NETCDF V7
 Identifier: C1996546500-GHRC_DAAC
 Organization: NASA/MSC/GHRC
 Box: -55S -180W 90N 180E
 Date: 2003-10-26T00:00:00.000Z



Granule Search Result (1)

Analysis Ready Data Search for ECV (Demo, Granule Downloading)

- Step 4 – Retrieve Data
 - Select the Granule Entry
 - Click Retrieve Data button
 - Result: Shows WCS coverage list



CEOS WGISS Carbon Community Portal

Keyword Search...

Granule Search Result (1)

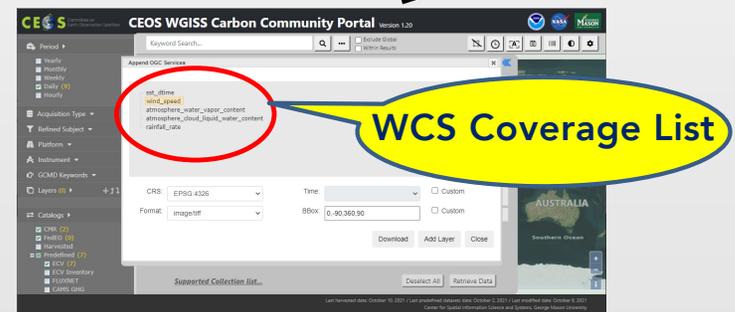
Available

Download access via S3 to the granule
Download f16_samsi_20211001v7.nc.cmr.json
This link provides direct download access via S3 to the granule
api endpoint to retrieve temporary credentials valid for same-region direct s3 access: OPHIDAP request URL
Documentation (SSM_Data_in_HetCDF.docx) Documentation (http) Documentation (html)
Documentation (pdf) Documentation (pdf) Documentation (pdf)
Documentation (pdf) Documentation (pdf) Documentation (pdf)
Documentation (https) Documentation (pdf) Documentation (pdf)
Documentation (https) Documentation (https) Product metadata

Supported Collections

Deselect All Retrieve Data

click



CEOS WGISS Carbon Community Portal version 1.20

Keyword Search...

Advanced OGC Services

st_time
int_time
atmosphere_water_vapor_content
atmosphere_soud_liquid_water_content
rainf_rate

CRS: EPSG:4326 Time: Custom
Format: image/tiff BBox: 0,90,360,90
Download Add Layer Close

Supported Collection List...

Deselect All Retrieve Data

WCS Coverage List



Analysis Ready Data Search for ECV (Demo, Granule Downloading)



- Step 5 – WCS GetCapabilities
 - Show WCS Coverage list
 - Select a “wind_speed” sub-dataset
 - Select CRS to “EPSG:4326”
 - Select format to “image/tiff”
 - Edit bounding box by clicking BBox input area
 - Click “Download” button
 - Internally invoke WCS GetCoverage request
 - Result: Downloading a file

The screenshot shows the CEOS WGIS Carbon Coverage interface. A search for 'wind_speed' has been performed, resulting in a list of datasets. The 'wind_speed' dataset is selected. The interface shows the following options:

- CRS: EPSG:4326
- Format: image/tiff
- BBox: 0,-90,360,90
- Download button

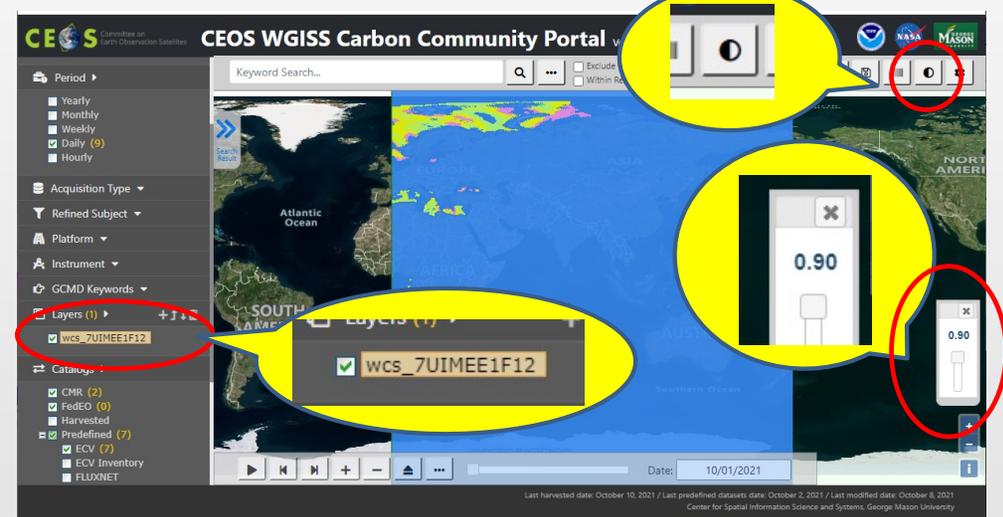
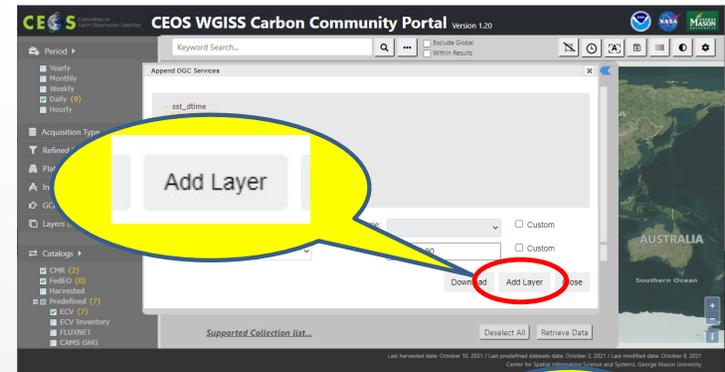
Yellow callouts highlight the search results, the CRS and Format dropdowns, the BBox input field, and the Download button.

The Bounding Box Editor dialog box is shown, allowing the user to edit the bounding box coordinates. The coordinates are: Top: 90, Bottom: -90, Left: 0, Right: 360. The CRS is set to EPSG:4326 and the Format is image/tiff.

The Save As dialog box is shown, indicating that the file is being saved to the Desktop. The file name is 'wind.tif' and the save type is 'TIF File (*.tif)'. The Save button is highlighted.

Analysis Ready Data Search for ECV (Demo, Granule Downloading)

- Step 6 – WMS Add Layer
 - Click “Add Layer” button
 - Added a layer on basemap
 - Select the layer
“wcs_XXXXXXXX” in Layers menu on left-side
 - Click Opacity button in toolbar
 - Change Opacity for the layer

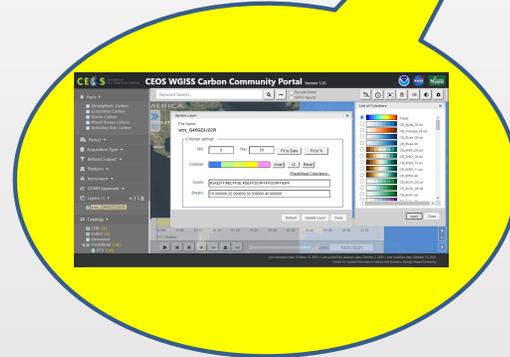
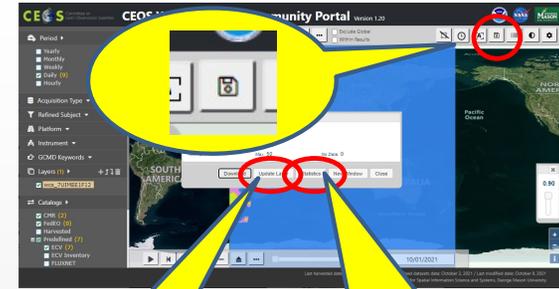




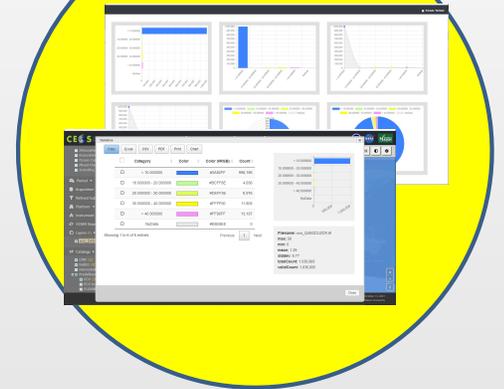
Analysis Ready Data Search for ECV (Demo, Granule Downloading)



- Step 7 – Optional Functions
 - Edit Colorbar
 - Click “Update Layer” button
 - Edit Interval and Color code values
 - Click Update Layer
 - View Statistical Information
 - Click “Statistics” button
 - Popup statistical information panel



Update Colorbar



Statistical Information



Analysis Ready Data Search for ECV (Demo, WCS Ready Dataset)



- Step 1 – Search WCS Ready Collection Datasets
 - Type “WCS” in keyword area
 - Result: 43 collection entries
- Click a dataset title in the search results
- Make sure exist of WCS buttons in the entry
- Result: Shows the granule search result

This screenshot shows the search results for the keyword "WCS". The search bar at the top contains "WCS" and shows 43 results. The first result is "AIRS/Aqua L3 Daily Standard Physical Retrieval (AIRS+ AMSU) 1 degree x 1 degree V006 (AIRX3STD) at GES DISC". A yellow callout bubble points to the search bar with the text "Type 'WCS'". Another yellow callout bubble points to the result title with the text "t (43)". A third yellow callout bubble points to the "Metadata (WCS)" link in the result's metadata section.

Granule Result

This screenshot shows the granule search results for the selected dataset. The search bar contains "AIRX3STD:006:AIRS:2002:08:31:L3:ResH4001_v4.0.0.0:G1320000481313.tif". A yellow callout bubble points to the search bar with the text "Type 'WCS'". Another yellow callout bubble points to the granule title with the text "t (43)". A third yellow callout bubble points to the granule metadata section, which includes the following information: "Box: -90S -180W 90N 180E" and "Date: 2002-08-31T00:00:00.000Z/2002-09-01T00:00:00.000Z".



Analysis Ready Data Search for ECV (Demo, WCS Ready Dataset)



- Step 2 – Invoke WCS GetCoverage request
 - Select desired granule
 - Click “Retrieve Data”
 - Result: Shows WCS dialog
- Select a sub-dataset
- Modify parameters
- Click “Download” button
- Result: Popup Save dialog box (or download immediately, depends on Web Browser setting)

