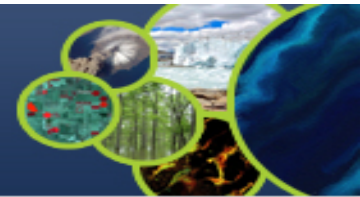




Progress of WGISS Carbon Community Portal Report to WGISS -50

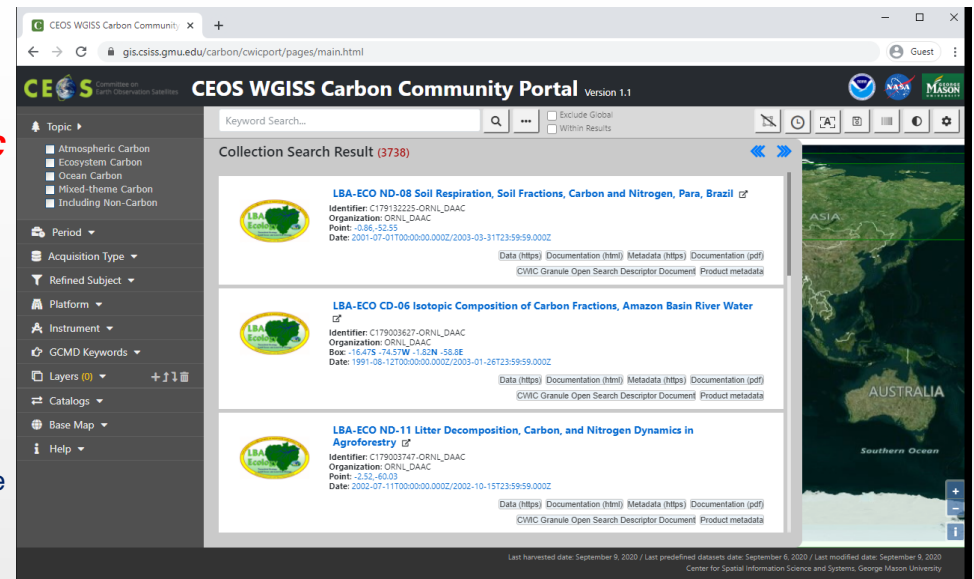


Goal: To support CEOS Carbon Science Mission by providing easy discovery of and access to carbon-related data resources in CEOS member agencies

The Objectives: *1) enable carbon community to easily find their interested data in the CEOS agency collections brokered by both CWIC and FedEO; 2) allow searching and accessing data within collections using CWIC and FedEO with keywords, spatial and/or temporal constraints; and 3) provide common discovery and access of all CWIC partner holdings targeting at the CEOS Carbon Community*

Summary of progresses since WGISS-48 in September 2019:

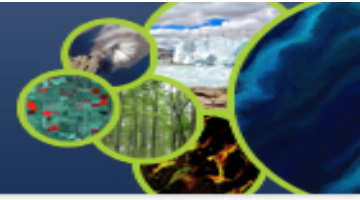
- Public release of CWIC Carbon Portal and subsequent revisions. Current version is Version 1.1
- Collected new requirements and inputs from the CEOS and GEOSS carbon science community and responded to requirements:
- Allowed searching of ECV and CDRs with additional filters
- Enabled interoperability with Open Data Cube (ODC)
- Released the white paper (architecture) on portal support to CEOS chair initiative
- Improved performance by server-side proxy and caching, adopting the Accessibility Insights for Web tool, GCMD hierarchical search
- Improved accessibility compliant to Web Content Accessibility Guidelines (WCAG) 2.0
- Explored the possibility of repurposing the portal to support other CEOS initiatives (e.g., coastal initiative)



Next steps: Enhances the portal to support new requirements from CEOS, GEOSS, and Global Carbon Project; Enhances interoperability with Open Data Cube; Explores the support to other CEOS Initiatives.



Summary of Contributions to CEOS Carbon Community



- Closely collaborate with CEOS Carbon Task and Global Carbon Project in the development of the portal to ensure it is useful for the community
- Collaborators are involved in
 - Define requirements
 - Design, test, evaluation
 - Use in their studies
 - Provide feedbacks for refinement and improvement
- Revisions of the portal was released to CEOS carbon community for use in July 2019
- The portal has been highlighted in the home page of the Global Carbon Project with a live link (See the screen capture right)
- Enabled support to CEOS Chair Initiatives on Forest Initiative and Open DataCube connection

GLOBAL CARBON PROJECT

HOME | CARBON ATLAS | CARBON BUDGET | CH₄ BUDGET | N₂O BUDGET | RECCAP | URBANIZATION | SEARCH

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The Global Carbon Project

The Global Carbon Project (GCP) integrates knowledge of greenhouse gases for human activities and the Earth system. Our projects include global budgets for three dominant greenhouse gases — carbon dioxide, methane, and nitrous oxide — and complementary efforts in urban, regional, cumulative, and negative emissions.

- CEOS WISS Carbon Community Portal**
website
- 8th International Symposium on Non-CO₂ Greenhouse Gases**
12-14 June 2019
meetings
- Second State of the Carbon Cycle Report (SOCCR2)**
website

Science Highlights

- Carbon Budget 2017
Carbon Budget 2017
- Methane Budget 2016
Methane Budget 2016
- N₂O Budget coming soon
N₂O Budget coming soon

More Highlights...

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Extended summary of progress

- Milestone 1: Demonstrated CWIC Carbon Portal at WGISS-48, Oct. 9, 2019
- Milestone 2: Released the white paper (architecture) on portal support to CEOS chair initiative, Jan. 2020
- Milestone 3: Released the version 1.1 of the portal, and deployed it in September 2020
- Progresses:
 - Testing and evaluation of the released portal
 - Collected new requirements and inputs from the carbon science community: Linking Open Data Cube (ODC)
 - Analyzed the new requirements and inputs to design the implementation approaches: Testing ODC API and designing metadata and data exchange interfaces with ODC
 - Implemented new requirements: Metadata harvesting at both collection and granule levels
 - Analyzed requirements from CEOS and VNSC for supporting the CEOS chair initiative
 - Prepared a white paper (architecture) to describe the feasibility and approaches for the portal to support the chair initiative.
 - Participated in GEO Week in November to integrate CWIC and the portal with GEOSS.
 - Improved performance of server-side proxy and caching logic for fetching contents under the Cross-Origin policy
 - Improved the portal accessibility by using the Accessibility Insights for Web tool
 - Improved efficiency by using the IndexedDB provided by web browser
 - Appended matching counter at each filter, including GCMD keywords
 - Improved performance of hierarchical GCMD keywords filter
 - Applied analytics by using the Google Analytics
 - Explored the possibility to repurpose the portable to support other CEOS initiative, such as CEOS Coastal Initiative

- Progress

- Performance improvement - Local Cached CWIC and FedEO Collections

- Both carbon-related and Full collections
- Transfer compressed cached metadata to reduce network traffic
- 15MB -> 2MB for Full CWIC
- 280MB -> 29MB for Full FedEO
- Changeable to use cached or on-demand searching
- Exclude global is truly working

- Progress

- User interface improvement - Filter and keywords tag UI interaction
 - All selected filters are shown at the keywords tag area
 - Keyword tag manipulation

The screenshot displays the CEOS WGISS Carbon Community Portal interface. On the left, a 'Filters' sidebar is visible with the following categories and selected items:

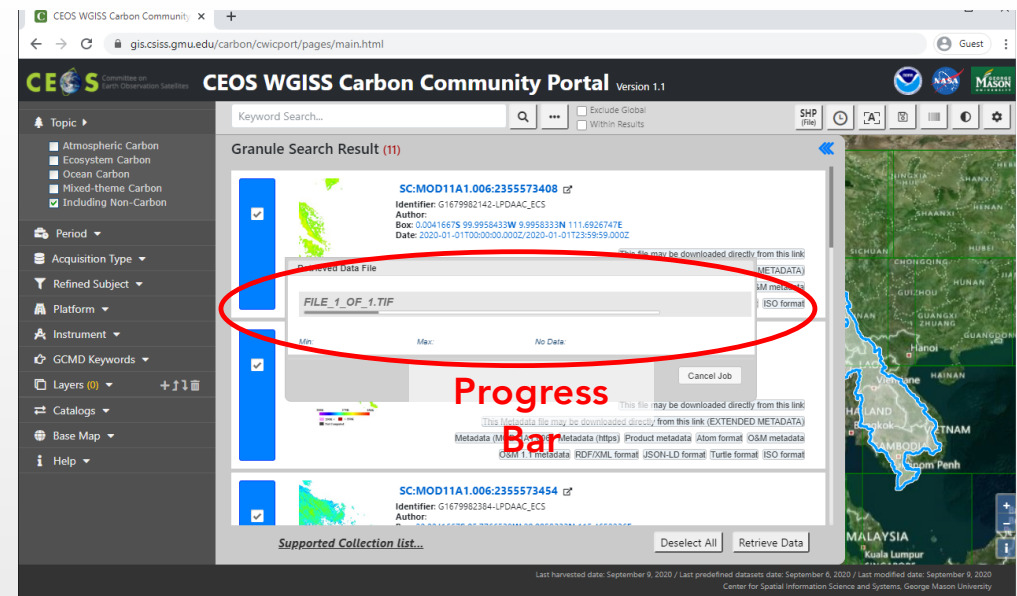
- Topic:
 - Atmospheric Carbon
 - Ecosystem Carbon
 - Ocean Carbon (47)
 - Including Non-Carbon
- Period:
 - Yearly
 - Daily (47)
 - Monthly
 - Hourly
- Acquisition Type
- Refined Subject
- Platform
- Instrument
- GCMD Keywords:
 - Agriculture
 - Atmosphere (47)
 - Aerosols
 - Air Quality (47)
 - Altitude
 - Atmospheric Chemistry
 - Atmospheric Chemistry/Carbon
 - Atmospheric Chemistry/Nitrogen

On the right, the 'Collection Search Result (47)' section shows a 'Keywords Tag Area' with the following tags: Ocean, daily, Atmosphere, and Air Quality. Below this, search results for 'AIRS/Aqua L3 Daily Standard Physical Retrieval (AIRS+AMSU) 1 degree' and 'AIRS/Aqua L3 Daily Standard Physical Retrieval (AIRS-only) 1 degree' are displayed, including metadata and documentation links.

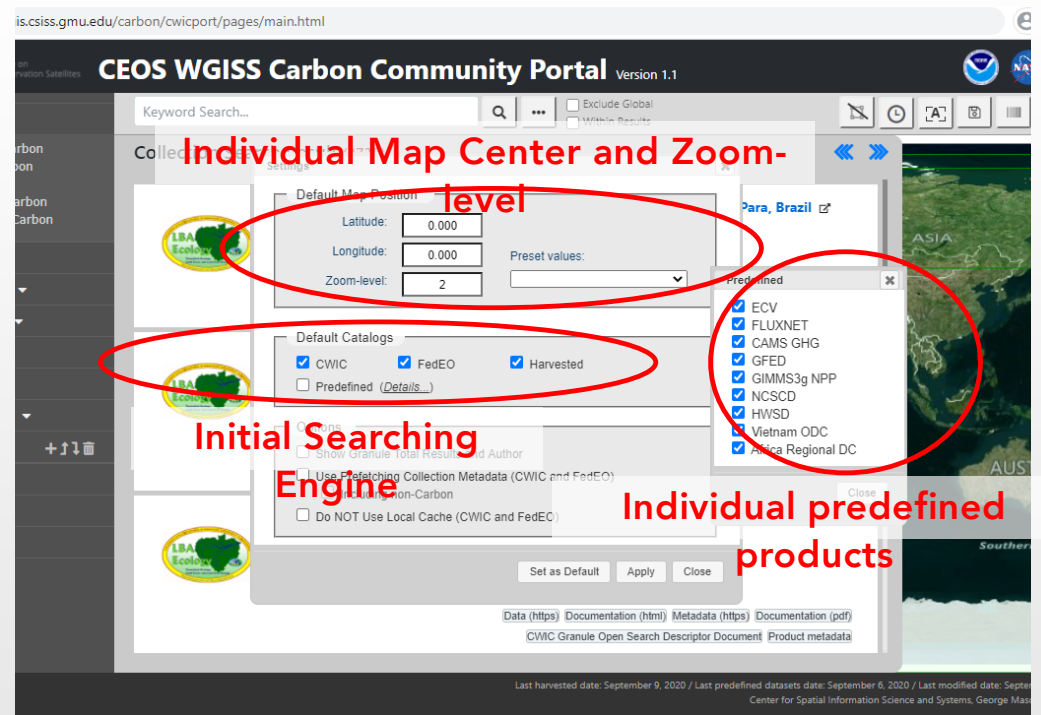
- Progress

- User interface improvement – Showing Processing Progress Status Bar

- Progress monitoring
 - Asynchronous image producing
 - Do not need to wait the portal usage until finishing producing
 - Can be performed multiple producing coincidentally



- Progress
 - User Preference Setting - Initial Configuration
 - Set default initial Map Center and Zoom-level
 - Selectable default initial searching engine
 - Selectable individual products as well as Top-level category



The screenshot shows the 'User Preference Setting' dialog box in the CEOS WGISS Carbon Community Portal. The dialog is titled 'Default Map Position' and includes the following sections:

- Default Map Position:** Latitude: 0.000, Longitude: 0.000, Zoom-level: 2. A red circle highlights these fields with the text 'Individual Map Center and Zoom-level'.
- Default Catalogs:**
 - CWIC
 - FedEO
 - Harvested
 - Predefined (Details...)
- Initial Searching Engine:** A red circle highlights the 'Initial Searching Engine' section with the text 'Initial Searching Engine'.
- Individual predefined products:** A list of predefined products is shown, including ECV, FLUXNET, CAMS GHG, GFED, GIMMS3g NPP, NCSCD, HWSD, Vietnam ODC, and Africa Regional DC. A red circle highlights this list with the text 'Individual predefined products'.

Buttons at the bottom of the dialog include 'Set as Default', 'Apply', and 'Close'. The background shows a map of South America with a red circle around the 'Para, Brazil' location.

- Progress
 - Support metadata from ODC – Prototyping with VODC
 - o Vietnam Open Data Cube
 - o Both Collection and Granule level
 - o Totally 39 collections (6 for Tasks, 33 for products)
 - o Supporting additional links

Totally 39 Vietnam Data Cube Collections

A New Portal Address

gis.csiss.gmu.edu/carbon/mekong/pages/main.html

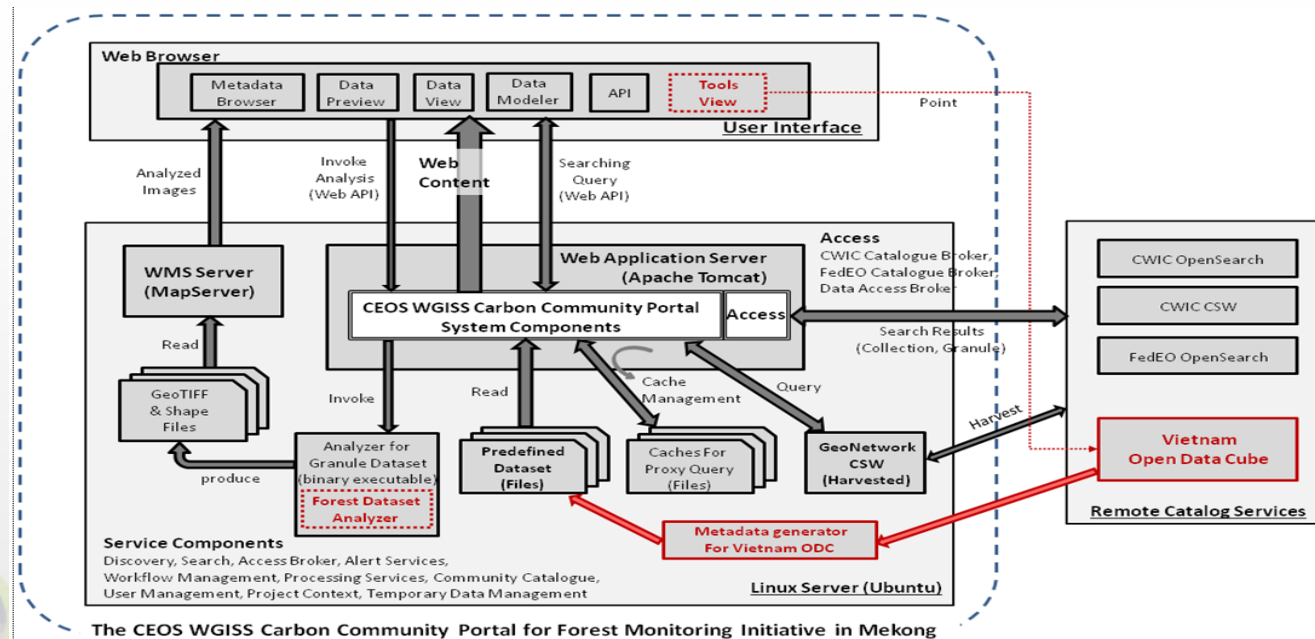
21 Granules for Cloud Coverage

Details and Additional Links



White paper for GEO Chair Forest Monitoring Initiative

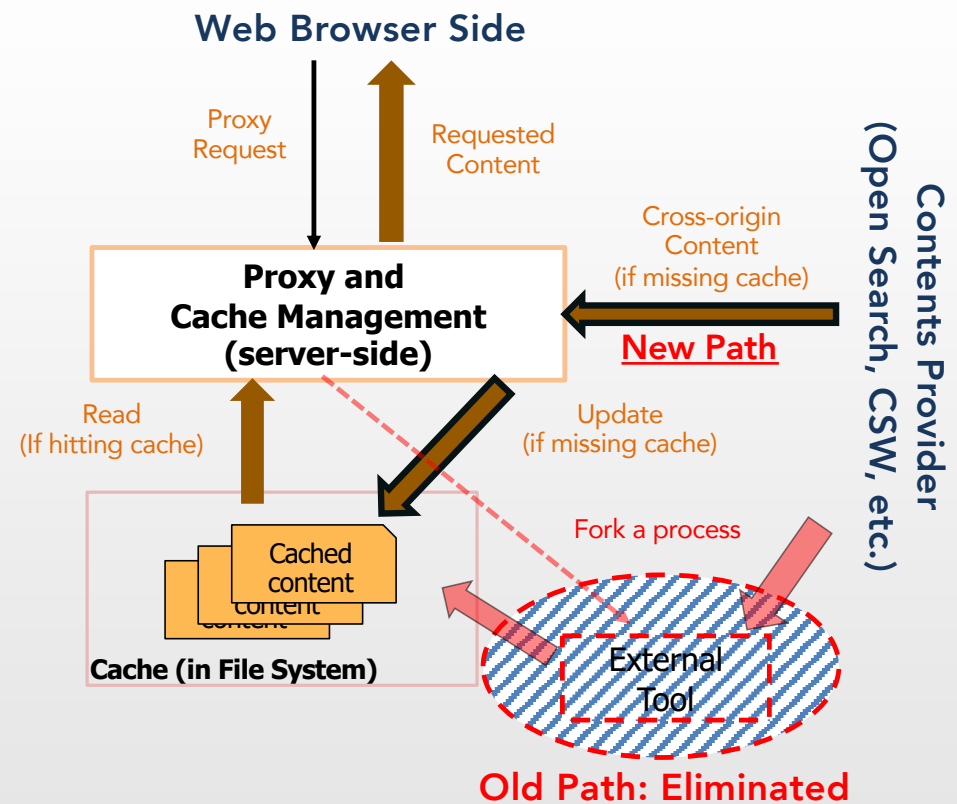
- White paper on architecture
 - Initial version on Dec. 1, 2019
 - Released on Jan. 14, 2020
 - Architecture Design following ISO/IEC 10746



Adaptation of the CEOS WGISS Carbon Community Portal for the Forest Monitoring Initiative in Mekong - Architecture

Document Identifier:	CWCCP4Mekong_Architecture_V0.2.0
Release Date:	January 14, 2020
Edition:	0.2.0
Edition Date:	January 14, 2020
Responsible Party:	General Science and Technology Solutions, Inc.
Audience:	Stakeholders of CWCCP project and Forest Monitoring Initiative (CEOS Chair Initiative)

- Function improvement – Improved performance of server-side proxy and caching logic
 - Transcoding Java version of servlets to Java 8 or higher
 - Do not fork a process for external tool when invoking proxy request
 - Efficient cache management, reduced response time, less memory usage on server-side





Finalizing version 1.0 of the portal

- Stability improvement – Finalizing version 1.0 of the portal
 - Deployed Version 1.0 in May 2020
 - Deployed Version 1.1 in September 2020
 - Clean up testing codes and console monitoring logs
 - Applied JavaScript minifier to deployment version only – making smaller and clear

Currently Version

CEOS WGISS Carbon Community Portal **Version 1.1**

Collection Search Result (3738)

- LBA-ECO ND-08 Soil Respiration, Soil Fractions, Carbon and Nitrogen, Para, Brazil**
Identifier: C17913225-ORNL_DAAC
Organization: ORNL_DAAC
Point: -0.08, -2.53
Date: 2001-07-01T00:00:00.000Z/2003-03-31T23:59:59.000Z
- LBA-ECO CD-06 Isotopic Composition of Carbon Fractions, Amazon Basin River Water**
Identifier: C179003627-ORNL_DAAC
Organization: ORNL_DAAC
Box: -76.478, -74.37W, -1.02N, 58.6E
Date: 1991-08-12T00:00:00.000Z/2003-01-26T23:59:59.000Z
- LBA-ECO ND-11 Litter Decomposition, Carbon, and Nitrogen Dynamics in Agroforestry**
Identifier: C179003747-ORNL_DAAC
Organization: ORNL_DAAC
Point: -2.52, -60.03

No console log (except critical errors)

Minified JavaScript Codes



The Portal Accessibility

- Accessibility improvement – Checked Web Content Accessibility Guideline (WCAG) 2.1
 - Checked by using Accessibility Insights tool (compatible with WCAG 2.1)
 - o Passed all checklist on FastPass
 - o Checked in Assessment checklist
 - o Adjusted higher color contrast ratio at each text content
 - o Appended alternative message or title at each required element
 - Passed Nu Html Checker (v.Nu) tool
 - o Checked HTML / CSS validation on source code level

Adjust higher contrast

No

Alternative Messages

Alternative Titles

The screenshot shows the CEOS Carbon Community Portal interface. A search bar at the top contains the text "Adjust higher contrast". Below the search bar, a list of search results is displayed. The first result is "LBA-ECO ND-08 Soil Respiration, Soil Fractions, Carbon and Nitrogen, Para, Brazil". A red circle highlights the LBA-ECO logo, and another red circle highlights the text "Alternative Messages". A third red circle highlights the text "Alternative Titles". The interface includes a sidebar with navigation options like "Period", "Acquisition Type", and "Refined Subject".

Failed 0 on FastPass check

The screenshot shows the "Automated checks" section of the Accessibility Insights for Web tool. The "Failed instances" count is 0, and the text "Congratulations!" is displayed. The "Automated checks" section is highlighted with a red circle.

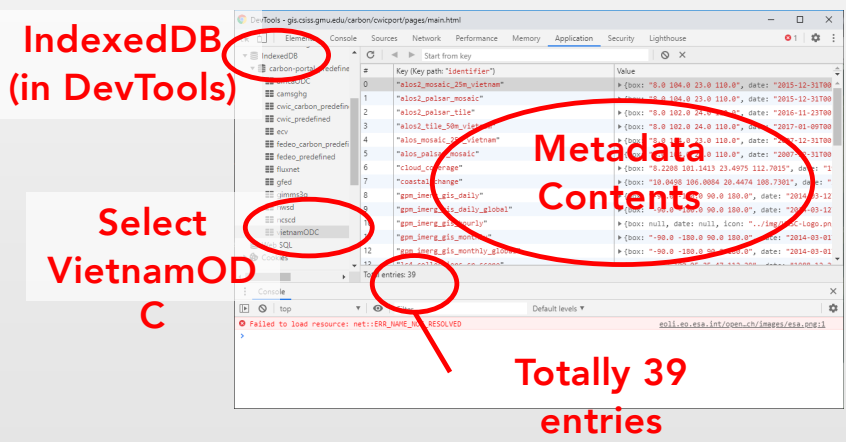
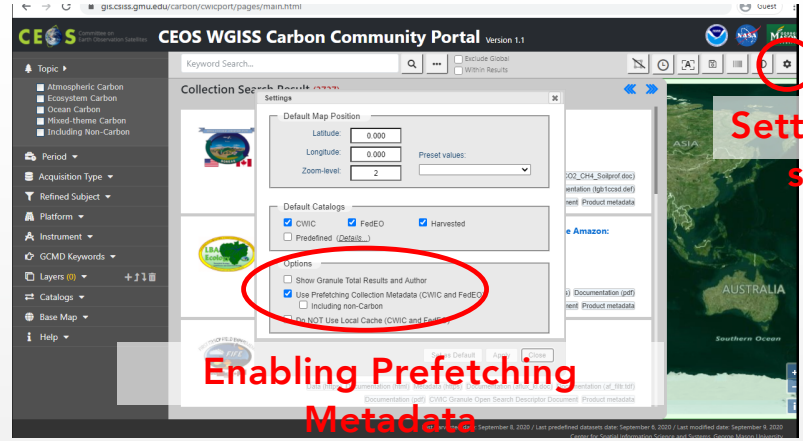
Failed 0 On Assessment report

The screenshot shows the "Assessment report" section of the Accessibility Insights for Web tool. The overall accessibility score is 77%, with a "Failed 0" count highlighted in a red circle. The "Assessment report" section is highlighted with a red circle.

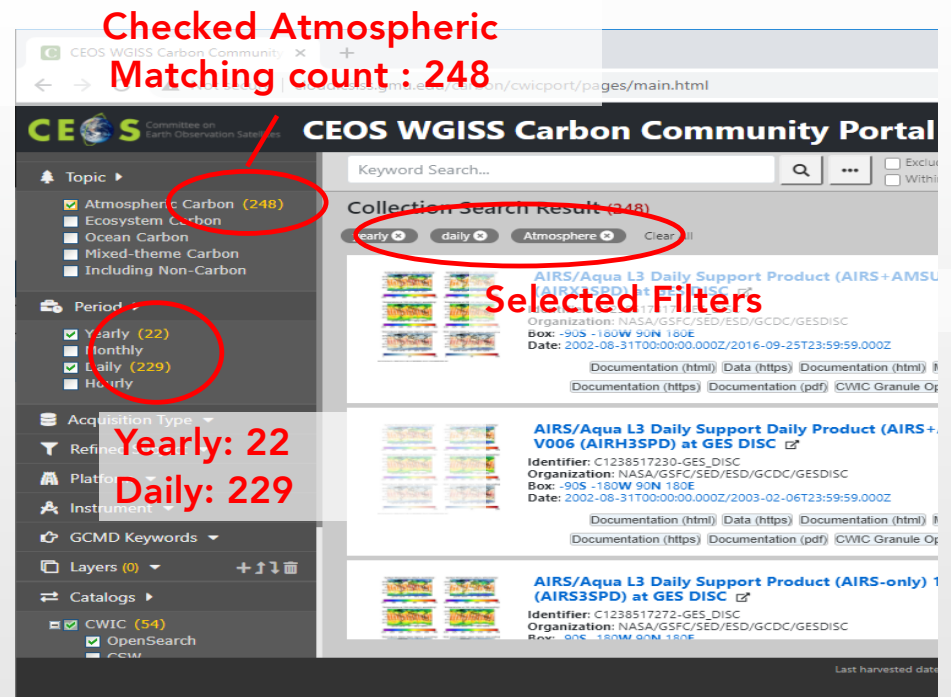


Using IndexedDB

- Efficiency improvement – Stored pre-cached datasets into IndexedDB
 - Pre-cached datasets are stored into client-side storage
 - Do not use network traffic for pre-cached datasets after storing into IndexedDB
 - Keeps up to date each stored dataset automatically at initial time



- **Function improvement –matching counter at each selected filter**
 - Shows matching counter at the end of each selected filter
 - Helps end-user to understand how many entries belong to each selected filter
 - Shows accumulated count at any upward parent filter if a filter is selected



Checked Atmospheric Matching count : 248

Selected Filters

Yearly: 22
Daily: 229

The screenshot shows the CEOS WGISS Carbon Community Portal interface. On the left, a sidebar contains filter categories: Topic, Period, Acquisition Type, Refine, Platform, Instrument, GCMD Keywords, Layers, and Catalogs. Under 'Topic', 'Atmospheric Carbon' is selected and circled in red, with a counter '(248)' next to it. Under 'Period', 'Yearly' and 'Daily' are selected and circled in red, with counters '(22)' and '(229)' respectively. The main content area shows search results for 'Collection Search Result (248)'. The 'Atmosphere' filter is also selected and circled in red. Three search results are visible, each with a thumbnail and metadata including organization, box coordinates, and date.

- **Performance improvement – Improved hierarchical GCMD keywords filter**

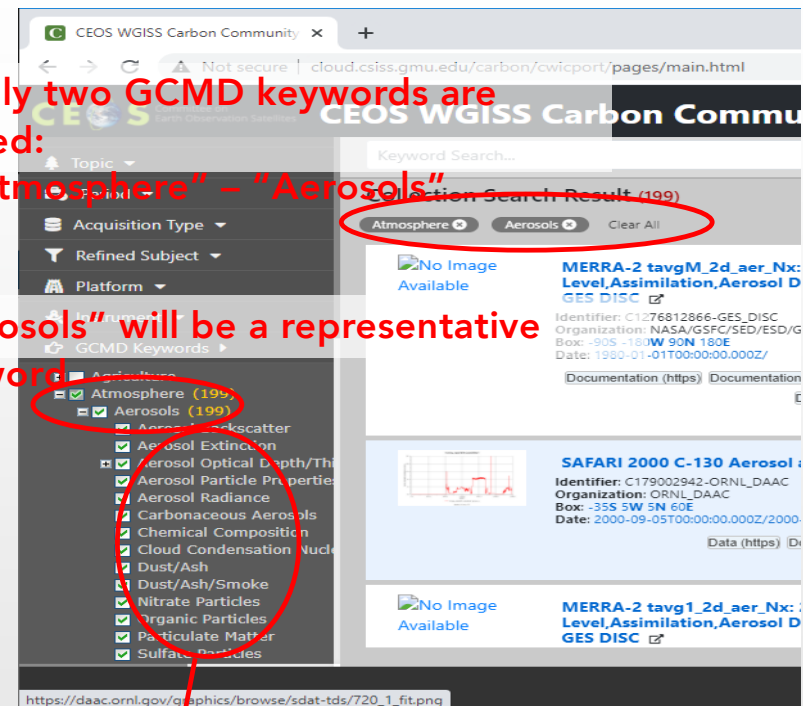
- Each keyword is representative of all children keywords
- When all children keywords are selected, the parent keyword will become a representative keyword
- Removes all marginal keywords which were reducing performance

Only two GCMD keywords are used:

"Atmosphere" – "Aerosols"

"Aerosols" will be a representative keyword

All children of "Aerosols" are selected



The screenshot shows the CEOS WGISS Carbon Community website interface. The search bar contains the keywords "Atmosphere" and "Aerosols". The left sidebar shows the "GCMD Keywords" tree with "Atmosphere" and "Aerosols" selected. The "Aerosols" keyword is highlighted in red, and its children are checked in the list below it. The right side of the page shows search results for "MERRA-2" and "SAFARI 2000 C-130" data.



Demo of Open Data Cube Connectivity (1/7)

- This demonstration is for Connectivity with Open Data Cube
- Demo Scenario:
 - Step 1) go to the portal URL

<https://gis.csiss.gmu.edu/carbon/cwicport/>

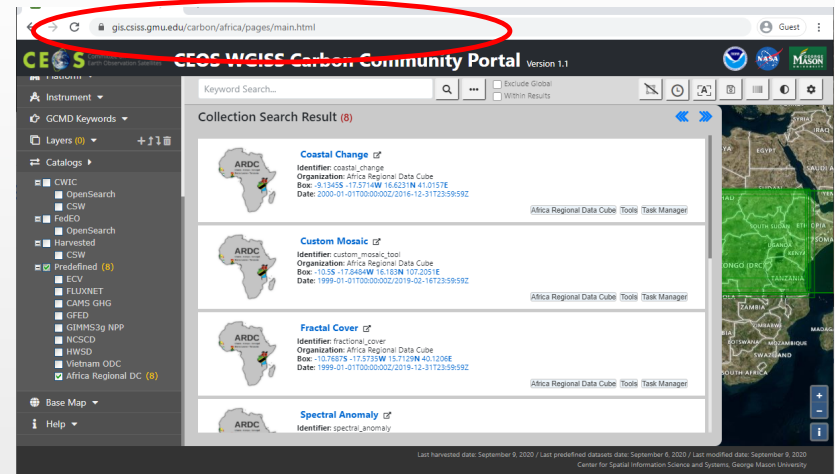
Or

<http://cloud.csiss.gmu.edu/carbon/cwicport/>

- o Both are same service endpoint of the portal
- o Especially for the Africa Region, the following URL is initially customized for the region

<http://cloud.csiss.gmu.edu/carbon/africa/>

Type the Portal URL



- Demo Scenario (Cont.):
 - Step 2) Checked “Africa Regional DC” at Predefined of Catalog filter
 - Uncheck all other catalogs may be helpful to reduce total number of matching datasets
 - Step 3) Click “Options” button, and set Spatial and Temporal restrictions
 - Spatial Range – type West 33.5, , North: -3.0, East: 34.0, South: -3.5
 - You can also use Bbox drawing tool or upload a shape file
 - Temporal Range – set April 15, 1999 to Dec. 26, 2016
 - You will get totally 8 Results

Catalog

Check "Options"

Check Africa Regional Data Cube

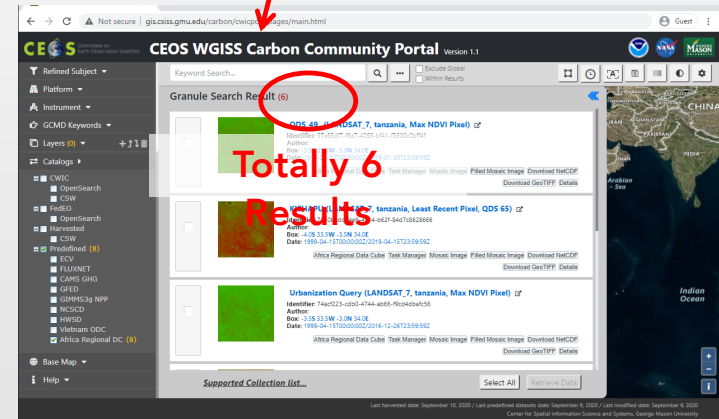
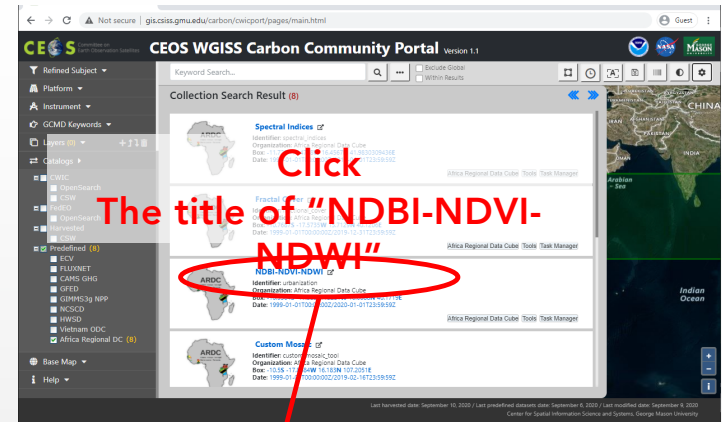
Open Options Dialog

Spatial and Temporal Constraints

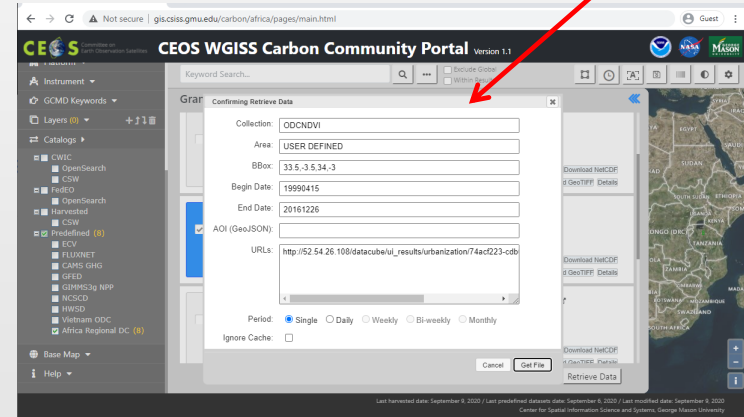
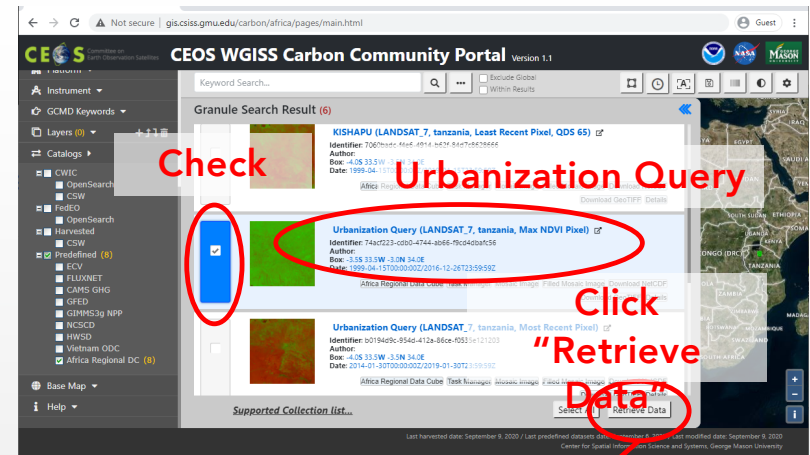
Click "Apply"

Totally 8 Searching Results

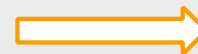
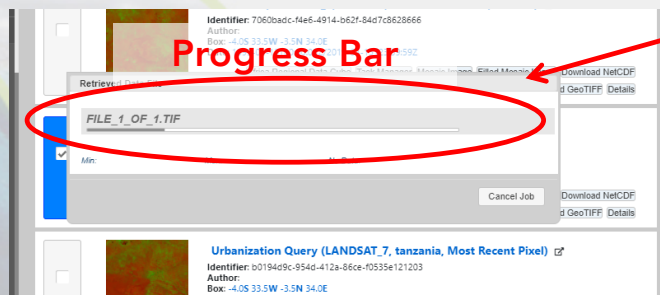
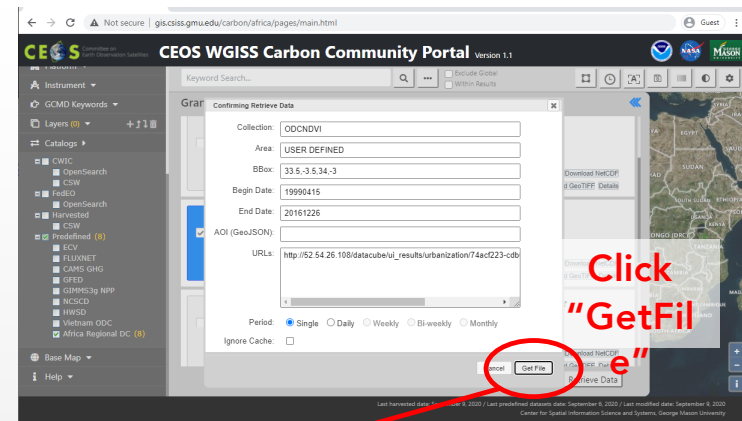
- Demo Scenario (Cont.):
 - Step 4) Scroll down and click the title of “NDBI-NDVI-NDWI” entry
 - o You will get totally 6 granule-level searching result



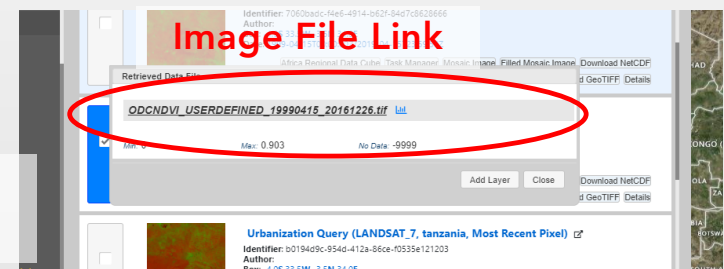
- Demo Scenario (Cont.):
 - Step 5) Check “Urbanization Query (LANDSAT_7, Tanzania, Max NDVI Pixel)” and then click “Retrieve Data” button
 - o You will get a dialog box for “Confirming Retrieve Data”



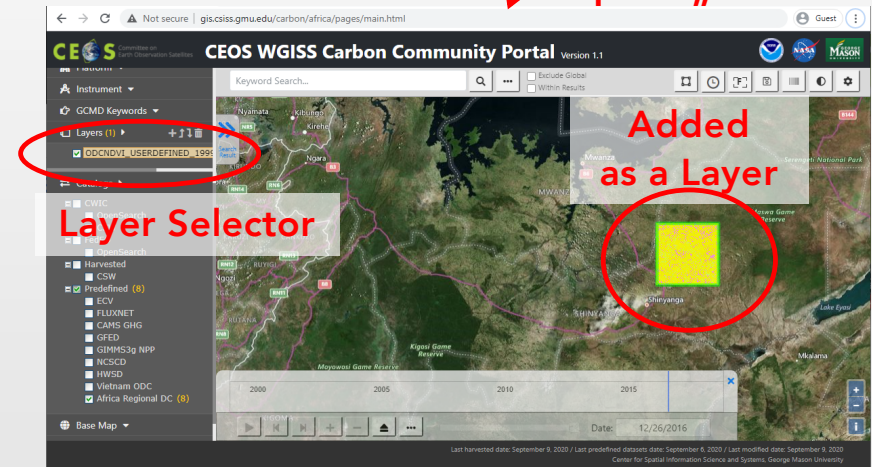
- Demo Scenario (Cont.):
 - Step 6) Review the parameters, and click “GetFile” button
 - o You will get a “Retrieve Data File” dialog box
 - o After reached the end of the Progress Bar, you will get an image file link for downloading



When finished



- Demo Scenario (Cont.):
 - Step 7) Download the image file and/or click “Add Layer”
 - o You will see the file name on the Layer selector, and the image will be shown on the base map
 - o You can see a statistical information by clicking a button which is on right-side of the image file name





Demo of Open Data Cube Connectivity (7/7)

- Demo Scenario (Cont.):
 - Step 8) Layer Manipulations
 - o You can select a layer by clicking the name in the Layer menu
 - o You can recall Get File dialog by clicking “Download” button in toolbar
 - o You can change opacity by clicking “Layer Opacity” button
 - o You can see statistical information and charts

Click "Download" button

Select a layer

Opacity

The screenshot shows the CEOS WGISS Carbon Community Portal interface. A map of Africa is displayed with a layer named "ODCNVLI_USERDEFINED_19990415_20161226.tif" selected. A red circle highlights the "Download" button in the toolbar. Another red circle highlights the "Layer Opacity" slider, which is set to 0.90. A third red circle highlights the layer name in the Layer menu.

Click

Click

Statistics

The screenshot shows the CEOS WGISS Carbon Community Portal interface with a statistics window open. The window displays a table of statistics for the selected layer. A red circle highlights the "Click" button in the statistics window. Another red circle highlights the "Click" button in the main interface. The word "Statistics" is written in red at the bottom of the screenshot.

Category	Count
< 0.180000	4548277
0.180000 - 0.361200	4824788
0.361200 - 0.541800	4824788
0.541800 - 0.722400	4824788
0.722400 - 0.903000	4824788
> 0.903000	4824788