User Manual

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GeoSTAC

Sponsor:
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Astrogeology Science Center

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1 Introduction

We are proud to present the GeoSTAC application. This project extends off of the existing CartoCosmos Leaflet web map and adds the ability to discover USGS Analysis Ready Data (ARD) holdings using the SpatioTemporal Asset Catalogs (STAC) API. This includes displaying image footprints and their related assets for individually map-projected images registered within USGS's STAC catalog and exposes how users can run queries using the API. Once a footprint is selected, the available STAC assets are listed for download or linked data can be directly streamed within many mapping applications (e.g., QGIS). The GeoSTAC application will make it easy for users to navigate through the surfaces of planetary bodies, filter their data search down to a particular area/time, and generate STAC API queries. This manual should help you install and maintain the GeoSTAC application. We hope it will be of use to the USGS and planetary science community as we continue to explore the worlds around us.

2 Installation

As part of the final delivery for this project the GeoSTAC application should have been installed on a platform of your choice. Overtime, you may change your mind and want to install the GeoSTAC application on another device or platform, this is a seamless process using conda.

To install the GeoSTAC application on another device or platform the first step is to ensure that conda is downloaded and installed on your device (conda [download](#)). Note you can use the lighter deviation of conda known as mamba as well.

Once conda is installed on your system the next step to installing the GeoSTAC application is to obtain the source code through the Github repository. Currently this can be found at: https://github.com/GeoSTAC/CartoCosmos-with-STAC once you have navigated to the applications repository page click the Code drop down menu and select your preferred method of downloading the project. You can also clone this repository with this git command:

```
git clone https://github.com/GeoSTAC/CartoCosmos-with-STAC.git
```
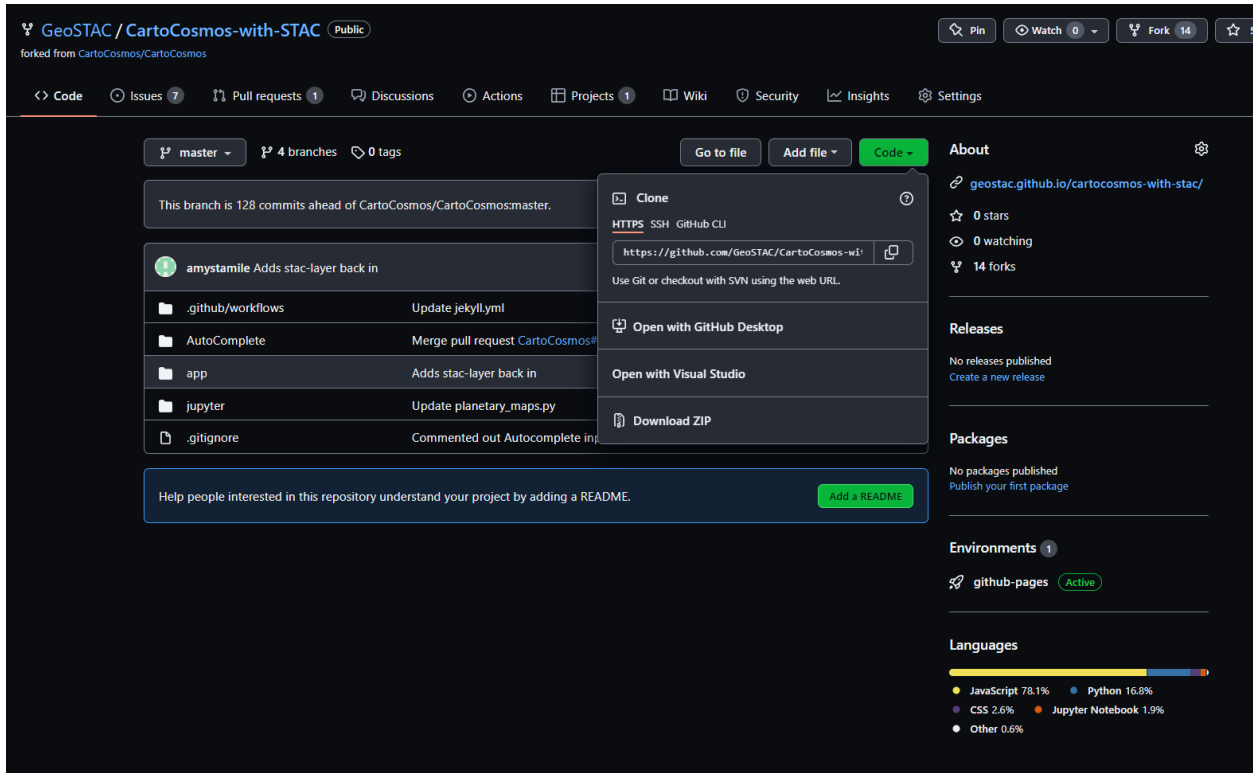
Once the application has been downloaded to the desired system, open up a terminal window and navigate to the app folder of the application.

ie: `cd cloned_location/GeoSTAC/CartoCosmos/app`

Once you have navigated to the app folder it is now time to set up the conda environment for this application. This can be done by running the following command:

```
conda env create -f environment.yml
```

After creating the conda environment you will need to activate it, this can be done by running the following command:

```
conda activate GeoSTAC
```

Once the conda environment is activated you will need to install the application and its decepticons. This can be done by running the following command:

```
npm install
```

From here to start the application, run the following command:

```
npm start
```

Note you can specify a port to start the application by running the following command instead:

```
npm start –port <port number>
```

From here you will be able to see where the application is accessible from in your terminal session.

```
(GeoSTAC) gavin@DESKTOP-SS0IF5U:~/GeoSTAC/CartoCosmos/app$ npm start

> leaflet-planetary@1.0.0 start
> webpack-dev-server --open --config webpack.dev.js

<i> [webpack-dev-server] Project is running at:
<i> [webpack-dev-server] Loopback: http://localhost:8000/
<i> [webpack-dev-server] On Your Network (IPv4): http://172.24.208.150:8000/
<i> [webpack-dev-server] Content not from webpack is served from './dist' directory
<i> [webpack-dev-middleware] wait until bundle finished: /
asset bundle.js 15.6 MiB [emitted] (name: main)
asset ./index.html 281 bytes [emitted]
orphan modules 258 KiB [orphan] 207 modules
runtime modules 28.3 KiB 14 modules
modules by path ./node_modules/ 4.92 MiB 1015 modules
modules by path ./src/ 365 KiB
  modules by path ./src/assets/img/ 104 KiB 14 modules
  modules by path ./src/js/*.js 183 KiB
    ./src/js/ApiJsonCollection.js 3.44 KiB [built] [code generated]
    + 12 modules
  modules by path ./src/components/ 55.8 KiB
    modules by path ./src/components/presentational/*.jsx 49.2 KiB 10 modules
    modules by path ./src/components/container/*.jsx 6.67 KiB 2 modules
  modules by path ./src/*.css 22.1 KiB
    ./src/styles.css 2.33 KiB [built] [code generated]
    ./node_modules/css-loader/dist/cjs.js??ruleSet[1].rules[2].use[1]!./src/styles.css 19.8 KiB [built] [code generated]
  ./src/index.jsx 246 bytes [built] [code generated]
webpack 5.69.0 compiled successfully in 6116 ms
```

3 Configuration and Daily Operation

Starting the Application

Once the GeoSTAC application is up and running, users should be able to go to the url it is hosted at and start using it. It may take a few moments to load the first page of footprints.

Note: As of May 2022, the app was available at https://geostac.github.io/CartoCosmos-with-STAC/, the url used during development, but may have since moved.

Top Toolbar - Planet, Projection, and Coordinates

Selecting a Planetary Body

To change planetary bodies, click on the planet selector menu in the upper left corner, which shows the name of the current body being viewed ("**MARS**" in the above figure). This will open a scrollable list of all available planets and moons (shown on the right).

Note: As of May 2022, only Mars and Europa have STAC data available, but more bodies such as Venus may be added in the future. Bodies without planetary STAC data may still be viewed, but no data footprints will be shown.
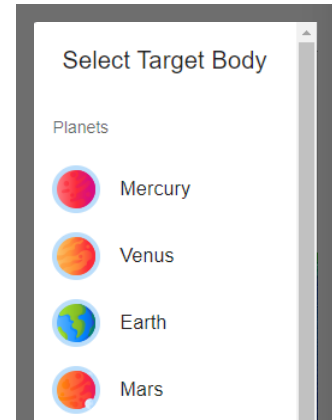
Changing the Projection

The three-button switch may be used to change to set the projection as north polar, cylindrical or south polar. Cylindrical is the default projection, north and south polar are not available on all planetary bodies.

The Coordinate System

The longitude and latitude are displayed next to the planet selector menu. The coordinate system may be set to [east | west], [centric | graphic], and to a [180 | 360] degree longitude range, by using the switches in the top toolbar.

Left Toolbar - Navigation and Area Selection

Navigation

To zoom in or out, click the + and - magnification buttons in the top left corner of the map. Or, place the mouse cursor on an area of interest and scroll the mouse wheel up and down. Some devices with touchscreens or touchpads may support pinch to zoom.

To pan around on the map, click and drag.

To center the map, click the center button on the top left (under the + and - magnification buttons).

Area Selection

To select an area, first click the square (in the left toolbar under the centering button). Then, click and drag diagonally across the map to mark a rectangular area. To show footprints only in the selected area, check the "Selected Area" checkbox in the right sidebar and click the `Apply` button.

Editing an Area Selection

To edit the selection, click the edit icon (above the trash can icon on the left), then drag the corners or center of the selection. Click "Save" next to the edit icon to save the new selection. Check the "Selected Area" checkbox in the right sidebar and click the `Apply` button to see footprints in the new modified area.

Deleting an Area Selection

To delete an area selection, click the trash can icon in the left toolbar and then click "Clear All". When a new rectangle is drawn, the previous rectangle will be automatically deleted. To remove the limit on the area in which footprints are displayed, uncheck the "Selected Area" checkbox in the right sidebar and click the `Apply` button.

Footprints and the Map

For planetary bodies with footprints, the footprint outlines will be displayed on the map. Click on a footprint's outlined area to show or hide the thumbnail for that footprint.

Click and drag to pan around the map. Use the mouse's scroll wheel, the + and - magnification buttons, or a touchscreen to zoom in and out on the map.

Right Sidebar - Data Footprint Filter and List

Click the vertical gray strip labeled "**Sort and Filter**" to show or hide the sidebar.

Filtering by Area

1. Click the square in the left toolbar and draw a rectangle over a map area to select it.
2. Check the "Selected Area" checkbox under the "Filter By…" section of the right sidebar.
3. Click the `Apply` button at the top of the right sidebar.

If any footprints are available in the selected area (and match all checked filters), they will load in a few moments.

Filtering by Date

1. Open up the "Date Range" section under the "Filter By…" section of the right sidebar.
2. Use the date inputs to set a start and end for the date range. Clicking the calendar will bring up a visual date selector, but it may be faster to simply type in the dates (for example, type 01 24 1998 for January 24th, 1998).
3. Check the "Date Range" checkbox.
4. Click the `Apply` button at the top of the right sidebar.

If any footprints are available in the set date range (and match all checked filters), they will load in a few moments.

Showing More Footprints

The "Number of Displayed Footprints" slider may be used to set an amount up to 100. The user must click the `Apply` button in order to show the new number of footprints.

There may be more footprints (that match the current filter) than are concurrently displayed. Use the Page Navigator to see these footprints.

The Page Navigator is underneath the slider. The < and > buttons set the page number to the previous or next page of footprints. Click on a page number to set a specific page. The user must click the `Apply` button to go to the page that has just been set.

Footprint Results List

The Footprint Results List is under the Footprints Slider and Page Navigator. If there are more footprint listings than fit on the screen, the list can be scrolled through. It can

also be expanded to the full height of the page by clicking the ⤢ button. Each footprint has a "Metadata" button which can be used to view more data on that footprint.

When loading a new set of footprints, the Footprints Results List may take a few extra moments to load.

Query Console

To show or hide the query console, click the gray bar along the bottom labeled "Query Console". If the "Auto-populate with STAC Query" checkbox is checked, whenever a new filter is applied to the footprint search, an equivalent STAC query will be shown in the Query Console. This query can be copied for use in other environments.

4 Maintenance

Maintenance for the GeoSTAC application has been thought of ahead of time during our development phase. The application's weakest link when it comes to maintenance is the interactions with the STAC API. If the API were to receive a major update changing the formatting of how a STAC Catalog is structured the GeoSTAC Application would need to be updated in order to correctly handle the updated catalog. Along with potential changes to the catalog the other concern for maintenance that we have at this time is if the STAC API where to change domains the application's reference to the API would need to be updated as well.

Along with the interactions with the STAC API the other potential component that would need maintenance within the GeoSTAC Application is NPM packages and version updates. Currently with the given conda environment and list of versioned packages the GeoSTAC application will not be affected by future changes or updates to NPM packages. If you decide to update and or change the package version, do this at your own risk as there is a potential that updating a package could result in the application becoming unstable or completely unusable.

5 Trouble-shooting

Currently, we don't have very many well-known issues that need to be addressed other than a single small issue with the STAC API. This issue is with footprints not rendering for a user on the GeoSTAC application. If footprints are not rendering within the Leaflet

web map then it is likely that the STAC API is either unresponsive or temporarily unavailable. In this case the issue is not on the applications side but rather the API's side of operations. Troubleshooting for this issue is to verify that the API is live and can be visited in a browser.

6 Conclusion

Thank you for using the GeoSTAC Portal, and for working with us as we developed an intuitive solution for discovering planetary STAC data. We hope it will benefit the planetary science community in making new maps and discoveries in the years to come.

Regards from the developers
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While some of us are continuing to different careers, we would be happy to answer short questions about GeoSTAC.