

Smallsat Data Explorer User Guide

Version 0.1

Created 28 January 2020

Tool Release Notes¹

Table 1. Tool major release notes

Tool Release	Date	Details
	01/24/2020	Initial release of tool to NASA Headquarters (key stakeholder)

Users Guide Change Log

v0.1: Initial document draft describing the tool in its current state to NASA Headquarters.
Document created 23 January 2020.

¹ Note we do not currently have a formal definition of a release and the document will be updated corresponding with major changes and detailed as best possible.

1. Introduction

This tool is being developed as part of [NASA's Commercial Smallsat Data Acquisition Program \(CSDAP\)](#) to search, discover, and access Commercial Small Satellite (or Smallsat) data that has been acquired by NASA. Currently, this tool supports search, discovery, and access to Planet Labs Inc. data acquired as part of the CSDAP's evaluation phase. Access is restricted to NASA-funded projects. This document is intended to provide a detailed overview of the tool and its functionality. Additional information on the Commercial Smallsat Data Acquisition Program, data availability, and the technical specifications of the commercial data can be found at the CSDAP page.

2. Pages

The [Smallsat Data Explorer](#) consists of three web pages accessible directly by the navigation links provided below or by a convenient navigation panel found on the left side of the webpage.

- Welcome (🏠)—The Smallsat Data Explorer landing page. This page provides a brief explanation of the purpose of the tool for end users.
- Explore (🔍)—The explore page allows the public to search, discover, and order satellite data acquired as part of the CSDAP evaluation phase (ordering of data only available for approved NASA-funded projects and investigators). A complete guide on how to use the features on this page are found in the Data Exploration section of this User's Guide.
- About (📄)—This page provides a brief description of the Commercial Smallsat Data Acquisition Program (CSDAP) and the context of this tool within the program. Additional information on CSDAP and program contact information is found here.

In addition to these options in the navigation panel, it is possible to login to the tool directly by clicking the login icon (👤). Clicking on this icon produces a login prompt without redirection from the user's current page. In addition, a user may initiate a password reset from this interface.

Authentication for the tool is currently disabled.

3. Data Exploration

This section provides in-depth explanations and examples of how to use features within the Explore page of the Smallsat Data Explorer tool.

3.1 Overview

An overview of the Smallsat Data Explorer Explore page with major features labeled is provided in Figure 1. Descriptions of each feature are provided below.



Figure 1. Overview of the Smallsat Data Explorer's explore page. Highlighted and labeled features correspond to the numbered list in the text.

1. Navigation Panel—Facilitates fast navigation between the Welcome, Explore, and About pages with quick-access user login interface. More details on these pages are found in Section 2.
2. Map Features/Navigation—Map exploration features, including the ability to quickly search for locations, toggle on the [Mapbox high-resolution true-color satellite base map](#), and buttons for zooming in and out of an area of interest. More details on the capabilities and a demonstration is provided in the Additional Features section 3.4 below.
3. Map Explorer/Display Pane—Data exploration window. Facilitates identifying regions of interest and displays quick views of selected data scenes for exploration, search, and discovery of Smallsat data. The default basemap is the [Mapbox open street map](#).
4. Projects Panel—Interface for registered users to name and save projects (search queries) for quick retrieval. *This capability to save projects is not yet implemented and will require login.*
5. Area of Interest (AOI) Filter Panel—Filter by location feature. Allows users to draw, upload, manually enter, modify, or delete areas of interest. More details on the capabilities and a demonstration is provided in the AOI Filters section 3.2.1 below.
6. Date Filter Panel—Filter by date feature. Allows users to select a date or range of dates to search for available data. More details on the capabilities and demonstration are provided in the Date Filters section 3.2.2 below.
7. Metadata Filter Panel—Filter by metadata feature. More details on the capabilities and demonstration are provided in the Metadata Filters section 3.2.1 below.
8. Product Filter Panel—Filter by product type. More details on the capabilities and a demonstration is provided in the Product Filters section 3.2.1 below.

9. Results Pane—Returns a list of products identified through the search and discovery filters. Users can sort scenes and select those desired to be ordered. More details on the capabilities and demonstration are provided in the Scene Results section 3.3 below.
10. Order Panel—Provides approximate estimation of the amount of data selected (in square kilometers) and the ability to request an order from the NASA holdings. Users will be able to request data by March 30, 2020.

3.2 Filters

Filters in the Smallsat Data Explorer are utilized to search and discover commercial Smallsat data within NASA’s data holdings. The result of these filters is displayed in the tool’s Results Pane and described further in section 3.3.

3.2.1 AOI

There are three methods for providing and area of interest (AOI) to the data explorer in order to spatially filter the available data. By default, there is no AOI filter applied in the tool; however, an AOI is required for scene results to be returned by the tool. *Note that the tool only supports a single AOI per project.*

1. Draw an AOI—Selection of the “Draw an AOI on map” icon (📏) in the AOI Filter Panel will prompt the user to draw an AOI on the map. Crosshairs indicate the location of the mouse on the map drawing area. An AOI is drawn by a single click of the crosshairs at a desired location on the map, scrolling the mouse until the resulting blue rectangle

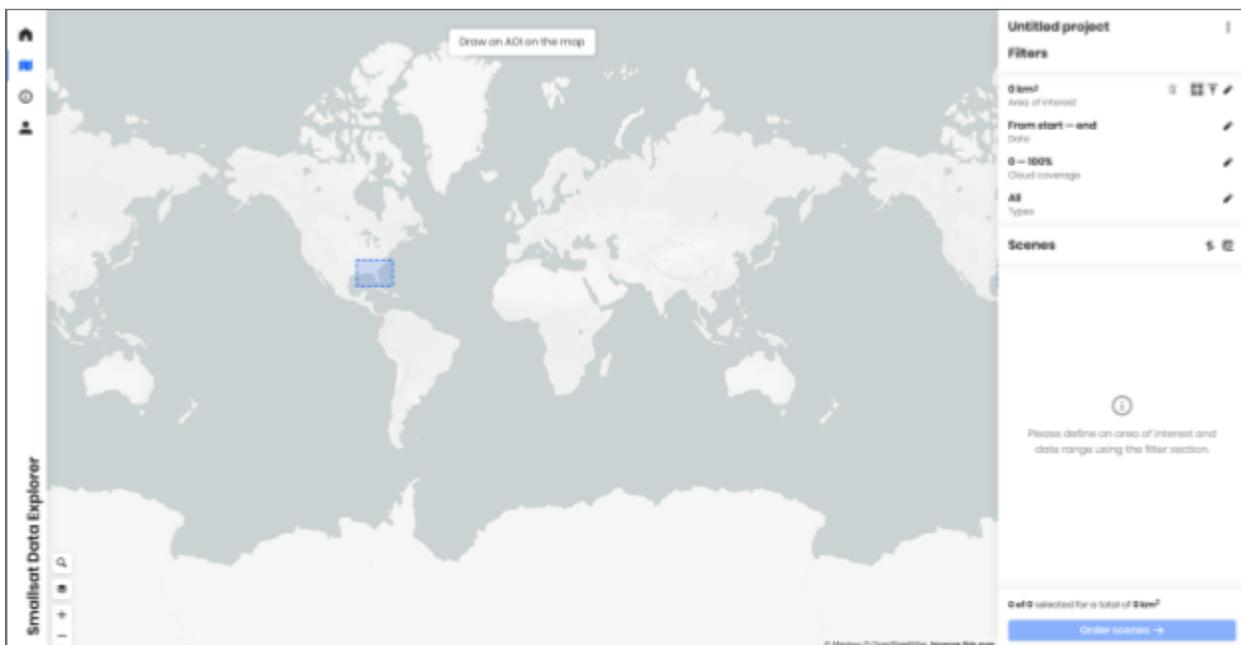


Figure 2. Example of an AOI drawn on the Map Navigation pane. The area selected is shown by the blue filled rectangle.

contains the entirety of the desired area, and followed by another single click of the mouse (Figure 2). If the “Draw an AOI on map” is selected when an AOI exists, the

current bounding rectangle will be selected and available for edit by dragging one of the corners to the desired location. Double clicking the icon will automatically zoom to the active AOI.

2. Upload an AOI—The tool supports upload of a GeoJSON file from a user's local machine to the tool. Selection of the “Upload an AOI (GeoJSON)” icon (⌥) will prompt a local directory file search window from which a valid GeoJSON file may be selected (Figure 3). When the GeoJSON contains multiple AOIs, the tool will automatically extract the full extent of coordinates and produce an AOI that encompasses all shapes.

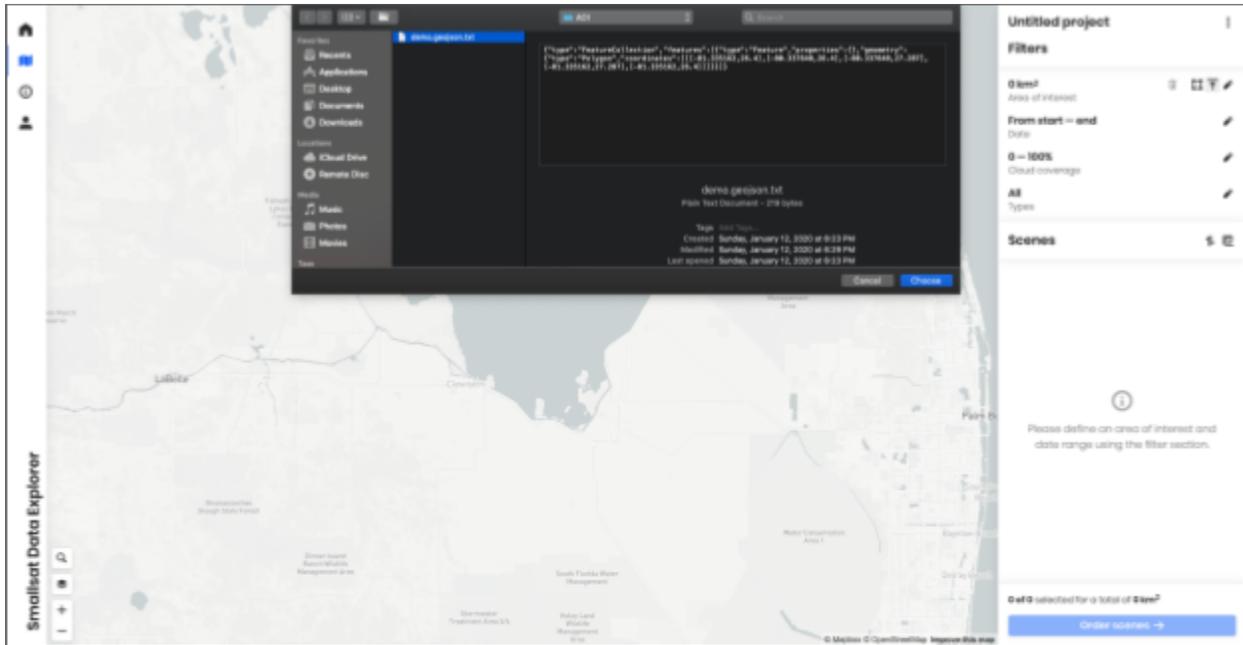


Figure 3. Prompt to upload AOI (geojson) from local machine.

3. Enter coordinates—Selection of the “Edit AOI bounds” icon (✎) will produce an Edit AOI prompt from which latitude and longitude values may be entered as decimal degrees for the Northeast and Southwest coordinates of a bounding rectangle (Figure 4). If an AOI currently exists, either from a previous manual entry, uploaded file, or drawn on the map, the existing coordinates will be available for editing by the user. The Apply button must be clicked in order for a new AOI to appear or to update existing bounds.

Selected AOIs, that is those rectangles that are actively being edited, will appear as a blue filled rectangle bound by dashed lines and filled circles at the corners. Otherwise the rectangle is bound by solid blue lines. Any AOI can be removed by clicking on the “Clear defined AOI” icon (⊞).

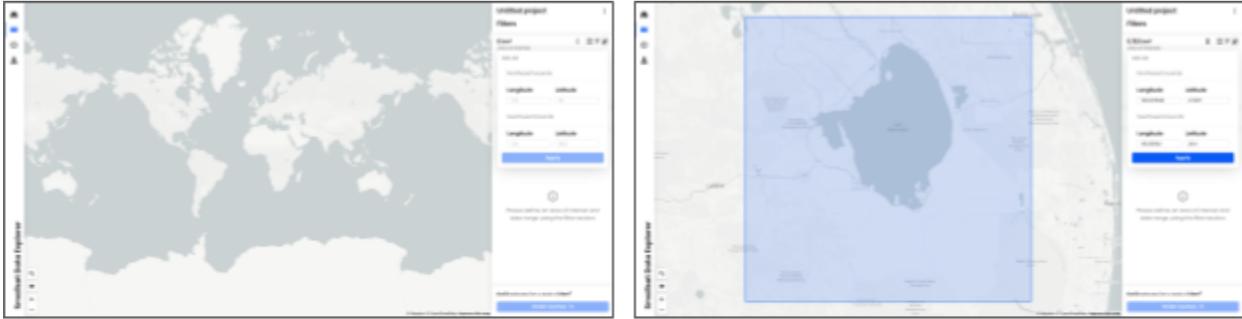


Figure 4. Edit AOI prompt without an existing AOI (enter new coordinates; left) and with an existing AOI (blue filled rectangle) available for editing (right).

For the provided area of interest, an estimate of the area covered is provided in millions of square kilometers (M km²). This provides users with awareness of the amount of data that may potentially be retrieved such that they can refine their request if necessary.

3.2.2 Date

Temporal filtering in the data explorer is available through a date selection interface. A valid date, or range of dates, is required for scene results to be returned. The current date is provided as a default. The date selection interface is prompted by clicking the “Select a date range” icon (✂). The initial “Edit date” interface is a two-month window surrounding the current date (Figure 5). Date navigation may be conducted forward and back one month at a time through the use of the arrows at the top right and left of the interface (< >), or in order to quickly navigate months or years, the fast navigation icon (⇌) may be selected such that any month is now selectable and arrows move forward and backward by year (Figure 6). Selected dates will be highlighted in blue. Once the desired start and end date are selected, “Apply” must be clicked in order for the

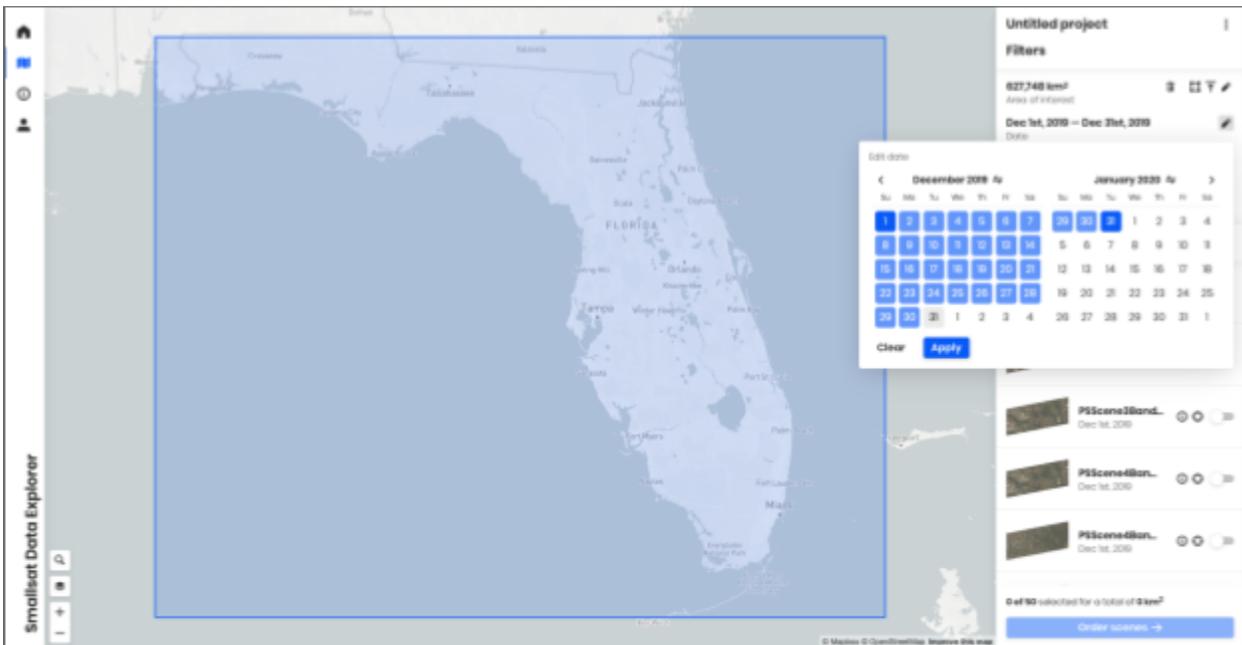


Figure 5. Selection of a range of dates using the date selection interface. The range of dates selected are highlighted in blue.

filter to be activated; the range will now appear on the main explore page. Clear removes all dates, (Note: This button does not revert back to the default setting.)

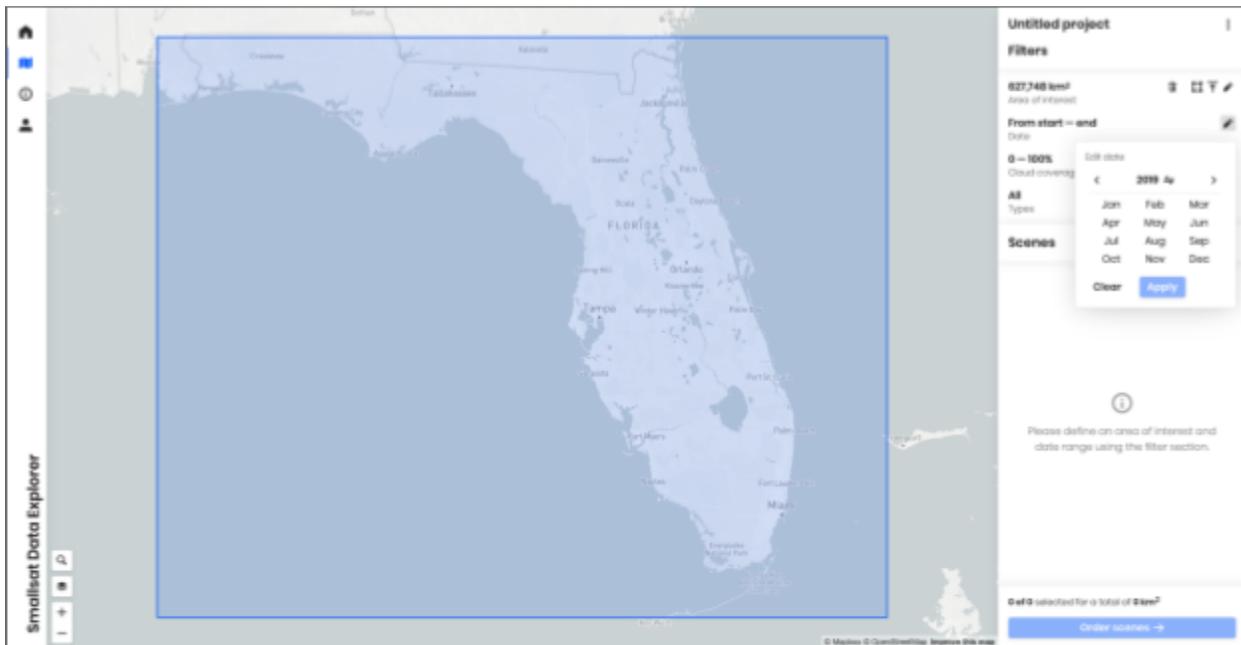


Figure 6. Date selection interface with quick navigation by year and month.

3.2.3 Metadata

Additional data filters are provided to support a more comprehensive search and discovery experience. These filters are supported by the metadata associated with each data file made available by the commercial data provider. Currently, the filtering of data by the amount of cloud cover in a scene is available. By default, all data, or scenes with cloud cover that ranges between 0 and 100%, are returned. Selection of the “View edit option” icon (✎) will prompt a slider widget where users can reduce the maximum amount of cloud cover they desire in their data (Figure 7). The maximum amount of cloud cover may also be entered in the value box to the right of the slider. After the desired value is selected, “Apply” must be clicked in order for the filter to be applied to the data.

Note that in general it is program policy that only scenes with less than 20% cloud cover are ordered from the commercial vendor. However, there are cases for which exceptions have been made. Therefore, users will likely notice a minimal reduction in resulting scenes when the filter is above 20%.

3.2.4 Product

Multiple products are available based on the platforms from which the data was collected and the processing applied to the data. “View edit options” (✎) for the Products filter allows users to select only those products desired by a simple toggle widget associated with product types (Figure 8).

Briefly described are the data product types available from Planet Labs, Inc. which may be requested from the Smallsat Data Explorer tool. Product naming conventions follow that which



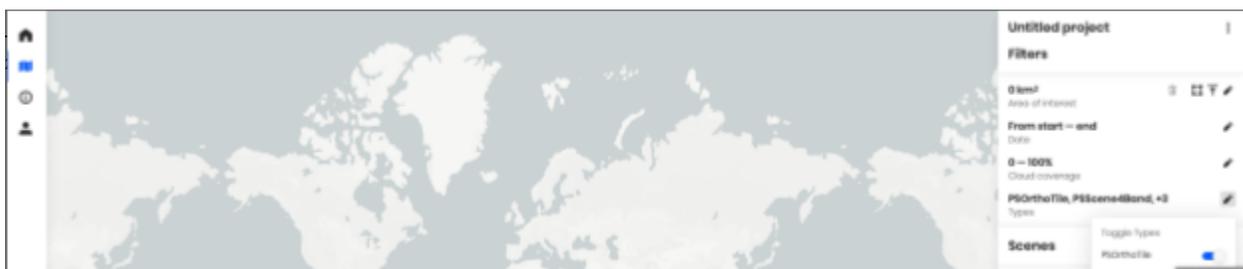
Figure 7. Cloud cover filtering interface

have been provided by Planet Labs, Inc. More information on the products may be found at the [Planet Labs, Inc. website](#), in their [products specification document](#), or at the CSDAP page.

- PSOrthoTile—PlanetScope 4-band radiometric and sensor correct imagery orthorectified and UTM projected
- PSScene3Band—PlanetScope 3-band Basic² and orthorectified scenes
- PSScene4Band—PlanetScope 4-band Basic and orthorectified scenes
- REOrthoTile—RapidEye 5-band radiometric and sensor correct imagery orthorectified and UTM projected
- REScene—RapidEye 5-band radiometric and sensor corrected Basic scenes
- SkySatCollect—SkySat orthorectified scenes composed into segments (typically about 60 scenes)
- SkySatScene—SkySat 4-band Basic (includes both raw and radiometrically corrected) and orthorectified scenes

3.3 Scene Results

An area of interest and date (or range of dates) is required in order for scenes to be returned. Any valid AOI and date range that encompasses data currently available will automatically return scene results. For every scene returned, users will initially see in the Results pane a thumbnail, the product type, and data collection date as well as icons to return additional



information about the scene, zoom to the results, and view the thumbnail in the Map Display pane (Figure 9). Additional details on these features are provided below.

3.3.1 Scene Information

Clicking the information icon (ⓘ) next to a returned scene will provide users additional information about that scene including (Figure 10):

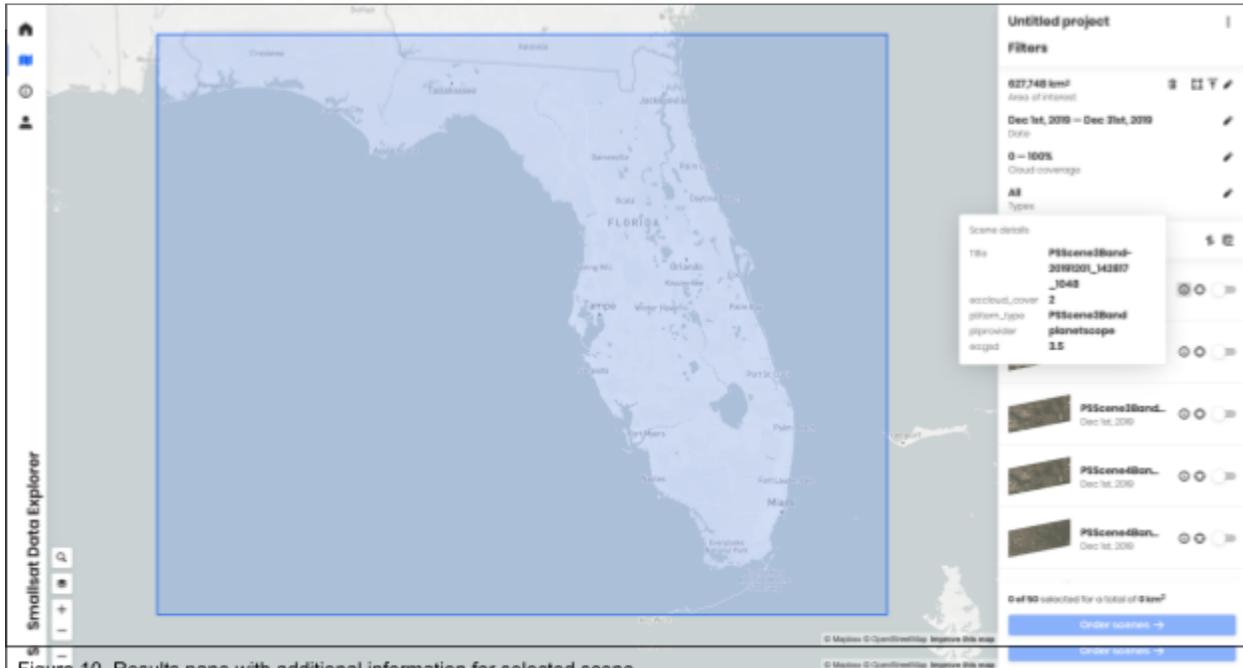


Figure 10. Results pane with additional information for selected scene.

Figure 9. Results pane with return from valid AOI and temporal filter.

- Title—Unique name of the scene following the naming convention found in the provider’s product documentation ([Planet Labs, Inc.](#)).
- Cloud Cover—Amount of cloud cover (in percent) in a scene as designated in the commercial provider metadata.
- Product (item) Type—Provider supplied product type. For Planet Labs Inc. this is based on the platform and processing applied. Product Type names will be one of those listed in section 3.2.4.
- Provider—Commercial data provider.
- Ground Sampled Distance (GSD)—Spatial resolution of the scene.

3.3.2 Sort

Scenes may be sorted, by selected the Sort By icon (⇅), to more quickly explore results (Figure 11). Results may be sorted by the date and cloud cover parameters and by ascending or descending values. By default, scenes are sorted in ascending order by date with no cloud cover considerations. Users cannot sort by more than one condition; sorting by both date and cloud coverage is not enabled. Current options will be denoted by blue text and checkmark. Results will automatically be updated when a different sort option is selected.

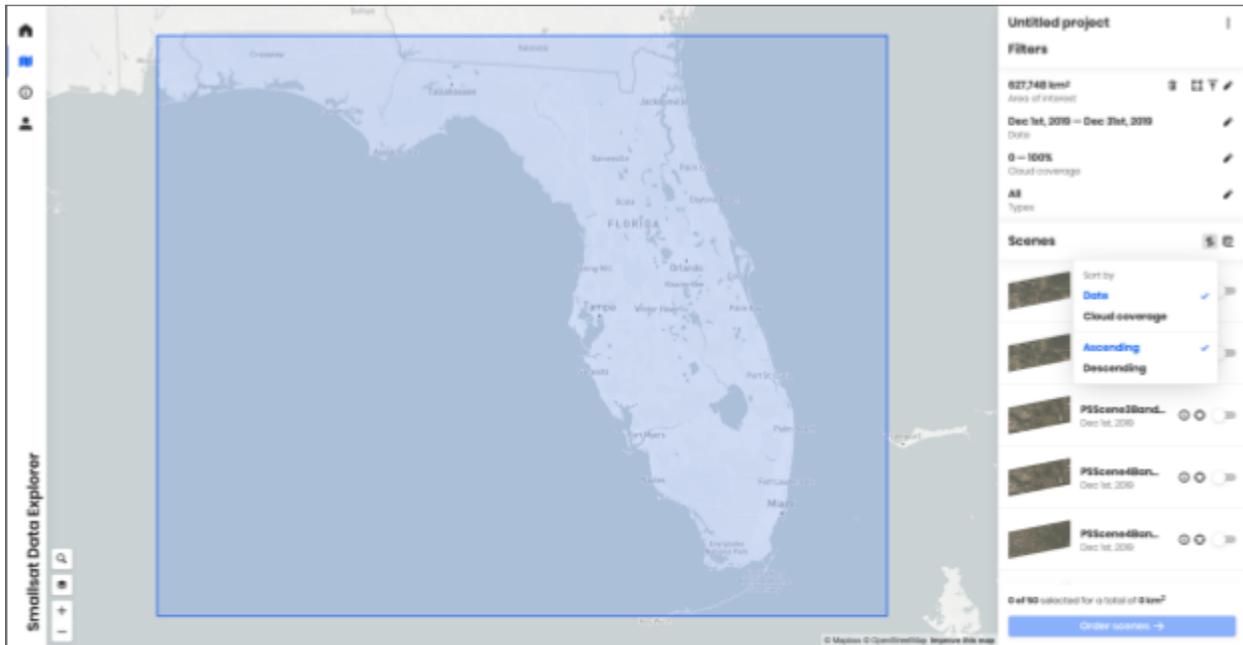


Figure 11. Results pane showing options to sort results. The current selection shows the default of sorting by ascending date.

3.3.3 Select

User access of data discovered in the Smallsat Data Explorer tools is through a request and approval process. Users request data by selecting the desired scenes from the Results pane and placing an order. Scenes may be selected by either clicking the tile with the individual scene

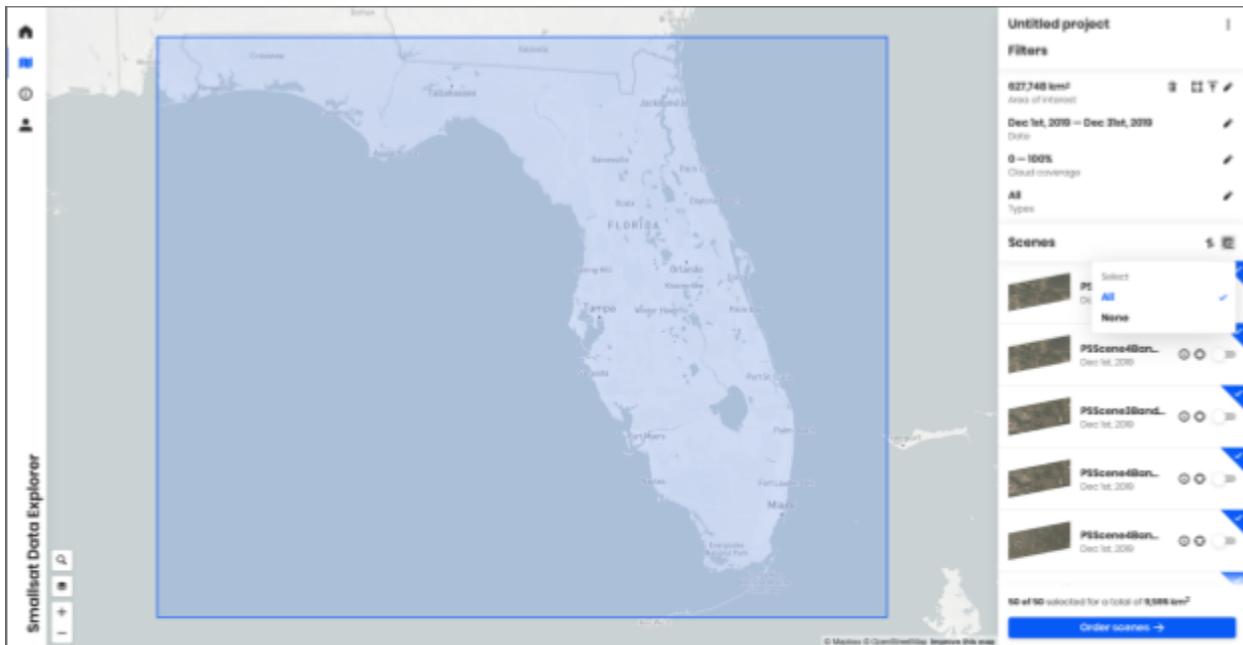


Figure 12. Results pane showing the selection of scenes for order.

information or through the Select button (☑) located just above the results from which either all scenes may be selected or deselected (Figure 12).

Note that while selection of scenes for ordering is enabled, the process of placing a request to order scenes remains under construction and is not available at this time.

3.3.4 Quick View

The tool supports visualization of scene thumbnails in the Map Display pane. Users are able to display any or all results through the toggle option (Toggle layer on/off); thumbnails are automatically placed or removed from the map when toggling on or off respectively (Figure 13). When multiple scenes overlap each other, such as might occur upon platform revisit of the area the next day, scenes with the highest sort priority will appear placed on top of the other scenes on the map. Click of the zoom to scene button (📍) will automatically zoom the Map Display pane to the full extent of the scene selected (Figure 14).

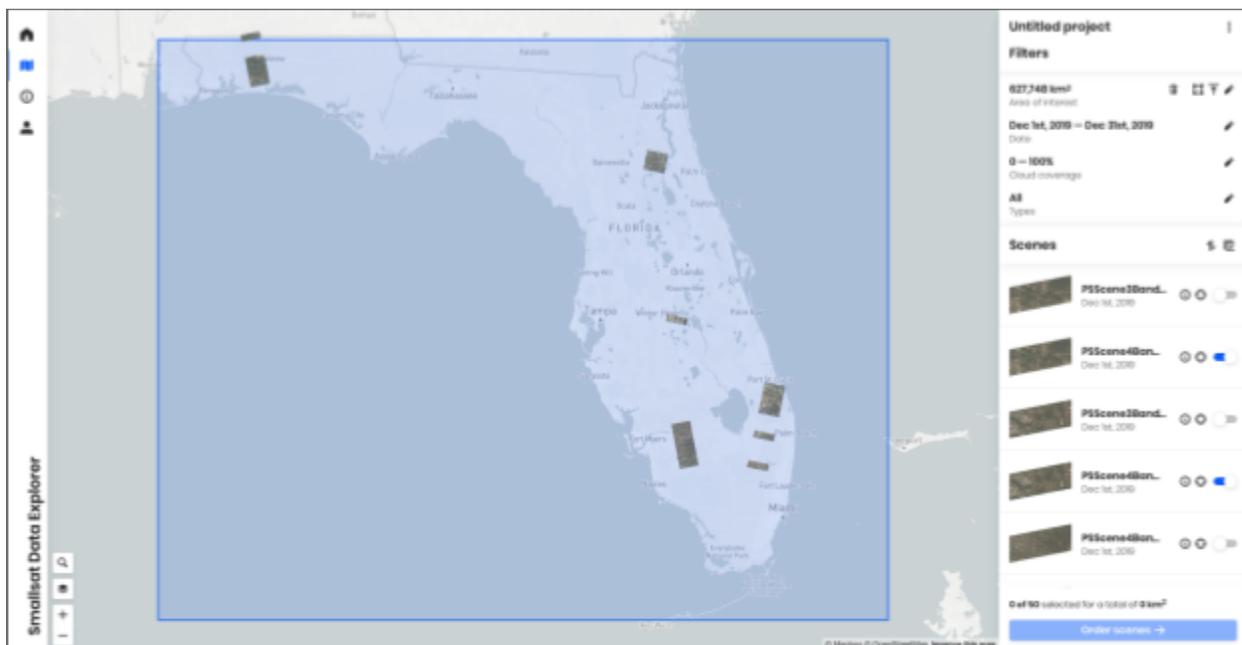


Figure 13. Map navigator pane with thumbnails overlain for select results

3.4 Additional Map Features

Search (Q)—Users are quickly able to zoom to specific regions quickly by quickly entering keywords in the search panel. Keywords may include, but not limited to, cities, states, and countries with automatic zoom to the location entered.

Toggle Layers—In addition to the Mapbox streets base layer, users may toggle on satellite basemap (derived from a variety of open source satellite imagery) through a toggle widget from the layers icon (☰).

Zoom—In addition to the automated zoom capabilities associated with the search and AOI features, users may use general zoom capabilities enabled by the buttons (+ / -) found in the

lower left of the navigator pane. Zoom in to a region upon double click of the mouse is also enabled.



Figure 14. Map navigator pane with zoom to specific scene using the Zoom to Scene feature. Note the overlap in scenes by perceived discontinuity in color.