FetchClimate 2 User Guide

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FetchClimate Overview

The challenge

Many environmental science research projects and applications require information about climate and other aspects of the environment. A huge amount of climate data is available for the whole of the Earth's surface. However, it can be challenging to find the data that you need and to extract useful information from that data. The difficulties inherent in locating data sets, downloading huge files, combining, filtering, interpolating, and regridding can present significant hurdles to efficient data use.

The FetchClimate solution

FetchClimate is a cloud-based intelligent climate information service that is designed to help overcome these challenges. It provides quick access to complex geographical information, including climatological information, returning exactly the data that you need. It does the necessary regridding in space and time to return your requested information, with uncertainty, and provenance for your query.

FetchClimate makes it easy to set up your query. You can specify:

- **Geographical regions** at any grid resolution, from global through continental to a few kilometers. You can select individual points, regions, or a combination of both.
- **Time series,** from yearly to seasonal, monthly, daily, and even hourly. You can specify a range of years, days within the year, or hours within the day.
- **Data,** such as air temperature, precipitation, or soil moisture. You also get information about the data sources used to fulfil the request and the uncertainty associated with the values. When multiple sources could potentially provide information on the same environmental variable, FetchClimate selects the most appropriate data source—or you can select a source that you prefer.

After you have the query set up, FetchClimate enables you to share your results quickly and easily. You can view your results graphically in the FetchClimate interface, and you can download the information as a .csv file. Share a direct link to your exact query through email, or copy the URL for the query so that others can retrieve the identical information.

FetchClimate can be accessed for free through a simple web interface. You can also call it through command line or by using a few lines of code inside any .NET program.

Using FetchClimate

There are four primary steps for using FetchClimate, outlined along the left side of the screen:

- Select geography
- Select information layer
- Select time
- Fetch and view results

Step 1: Select geography

The first step in setting up your query is to select the geographic region or points for which you want data.

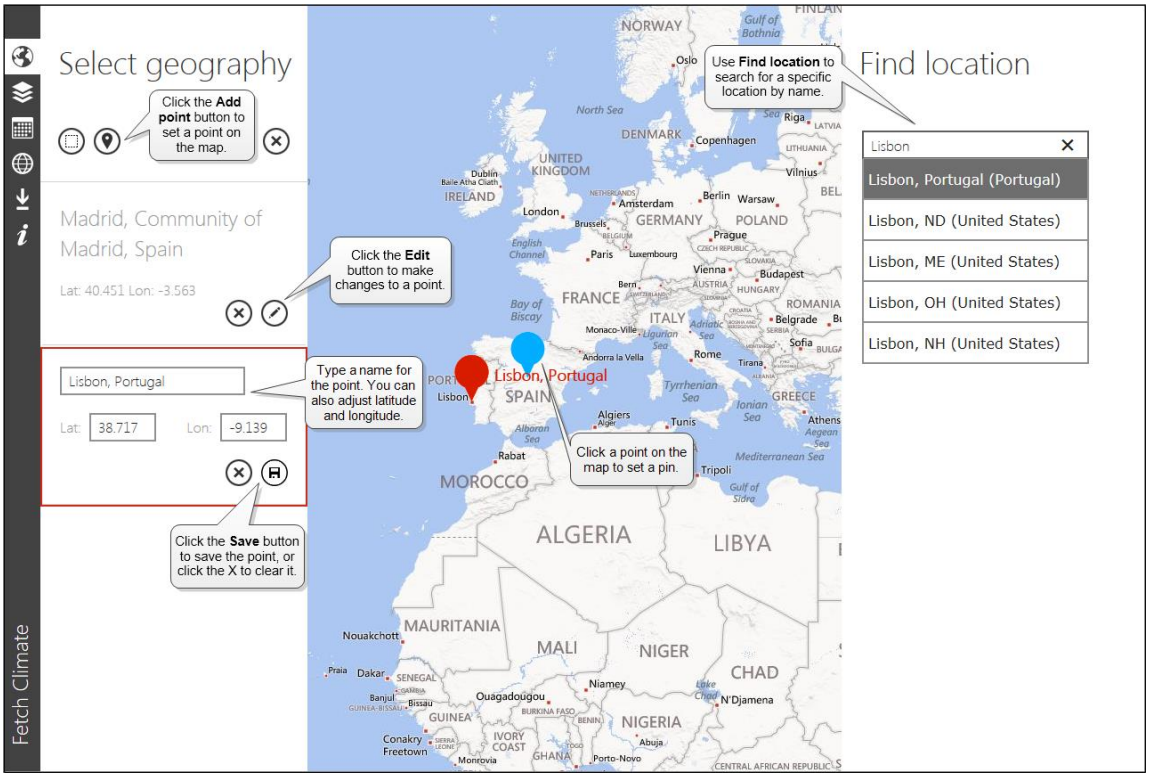
On the **Select geography** page, you can use the map to navigate to anywhere on the globe, or you can search for a location by name. Use your mouse to zoom in and out, or use the ⊕ and ⊖ buttons on the right side of the map. To move around on the map, click and drag.

The Select geography page enables you to select points, regions, or a combination of both.

Select a point

1. Find the location on the map, either by searching or by navigating to that point.
2. Click the **Add point** button .
3. Click the location on the map or click the name in the search results to set the point.
4. FetchClimate provides a default name for each point and shows the latitude and longitude. If you want, type a custom name for the point; you can also adjust the latitude and longitude.
5. To save the point, click the **Save** button.

TIP You can select as many points as you want. However, the more points and regions you select for one query, and the more detail in the timeframe you select, the longer it will take to run and the more data will be shown in your results file.



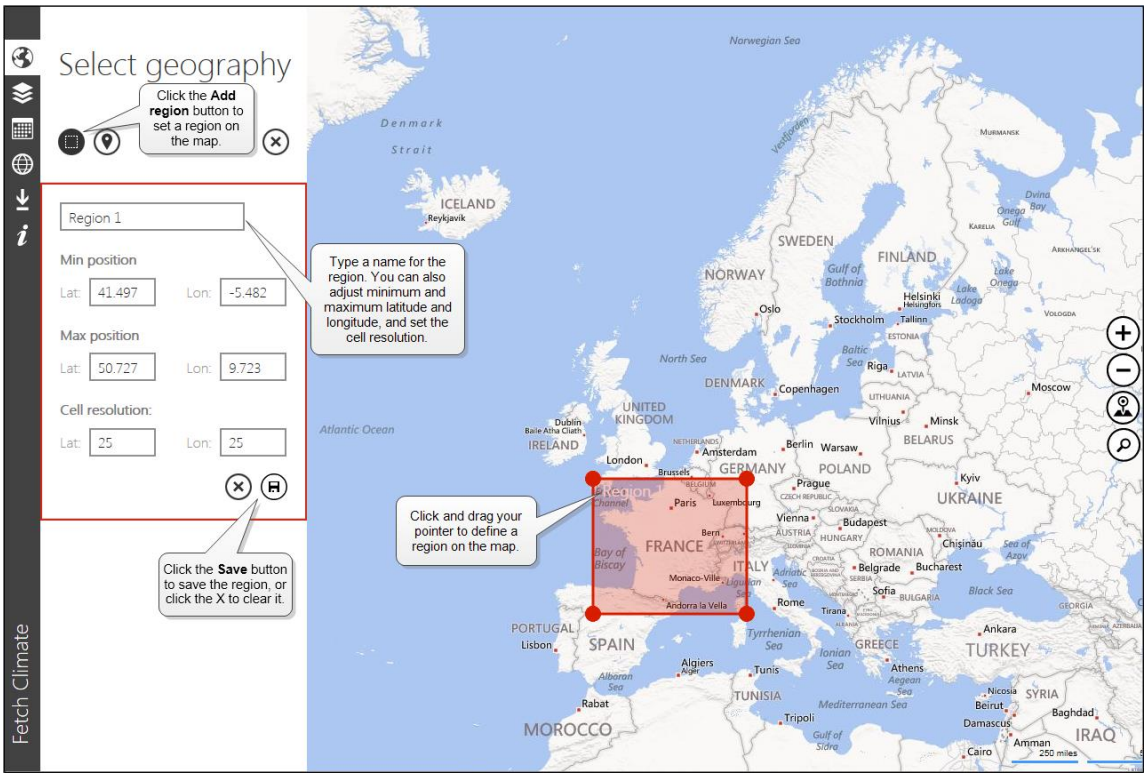
Select points on the map

- To delete a point, click the **Remove** button for that point. To delete all points and regions, click the **Remove** button at the top of the list.
- To make changes to a point, click the **Edit** button for that point, or click the point on the map.

Select a region

1. Find the region on the map, either by searching or by navigating to the region.
2. Click the **Add region** button.
3. On the map, click one corner of the region that you want to specify, and then drag your cursor to define the borders of the region.
4. FetchClimate provides a default name for each region. If you want, type a custom name for the region. You can also specify the minimum latitude and longitude positions, as well as the cell resolution (these values help set the granularity of the data).
5. To save your region, click the **Save** button.

TIP You can select as many regions as you want. However, the more points and regions you set for one query, and the more detail in the timeframe you select, the longer it will take to run and the more data will be shown in your results file.



Select a region on the map

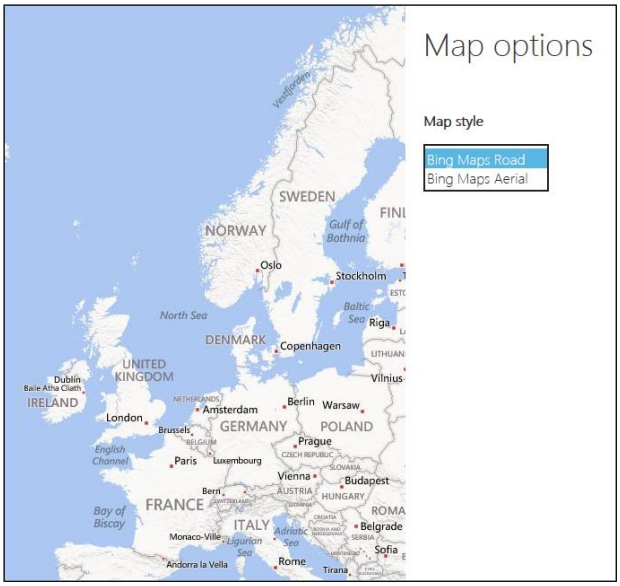
- To delete a region, click the **Remove** button for that region. To delete all points and regions, click the **Remove** button at the top of the list.
- To make changes to a region, click the **Edit** button for that region.

Search for a location by name

1. Click the **Search** button on the right side of the screen.
2. In the search box, type the name of the location that you want.
3. When you see the location name that you want, click it to locate it on the map.

Change the map style

1. Click the **Map options** button on the right side of the screen.
2. In the **Map options** list, click the map style that you want.

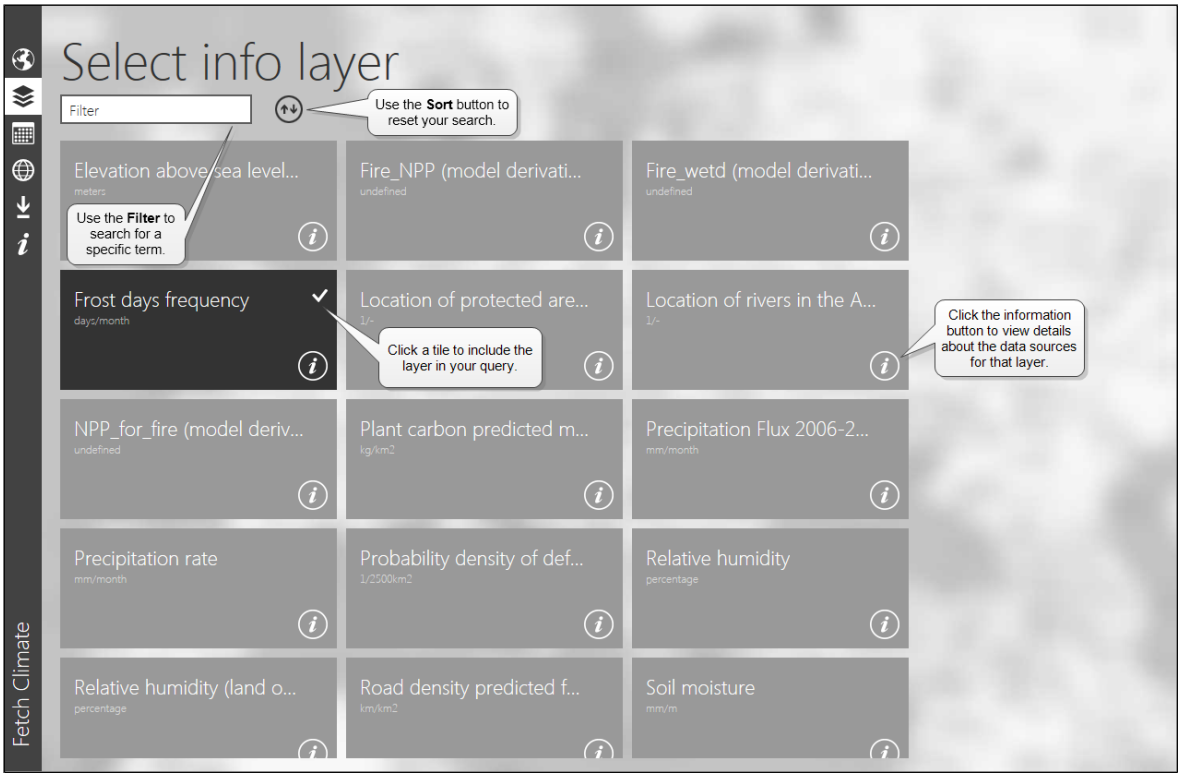


Change the style of the map

Step 2: Select information layer

On the **Select information layer** page, you can specify the information that you would like FetchClimate to return. You can also select the underlying data sources for this information.

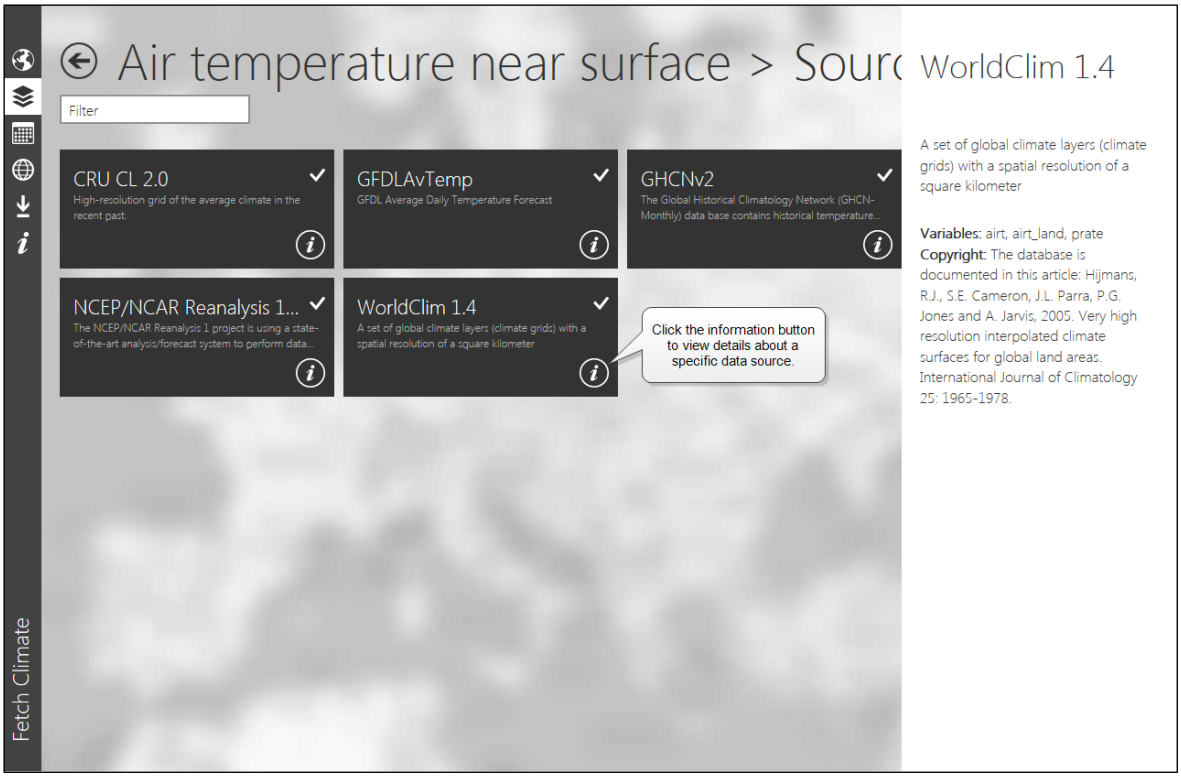
- Use the **Filter** to search for a specific term, such as *precipitation*. To reset your search, click the **Sort** button .
- To include a layer in your query, click the tile for that layer. To remove a layer, click the tile again.
- To see the data sources for a given layer, click the **Information** button on the tile.



Click a tile to include the layer in your query, or click the Information button to learn more about the sources

If there are multiple data sources, you can include or remove them by clicking the tile for each source, or you can use them all (the default). If you include them all, FetchClimate will automatically use the sources that provide the best data for the timeframe that you select.

Click the **Information** button *i* on the tile to see further details about the source, including a summary, variables, and copyright.



Click a tile to include the source in your query, or click the Information button to see details about a source

Step 3: Select time

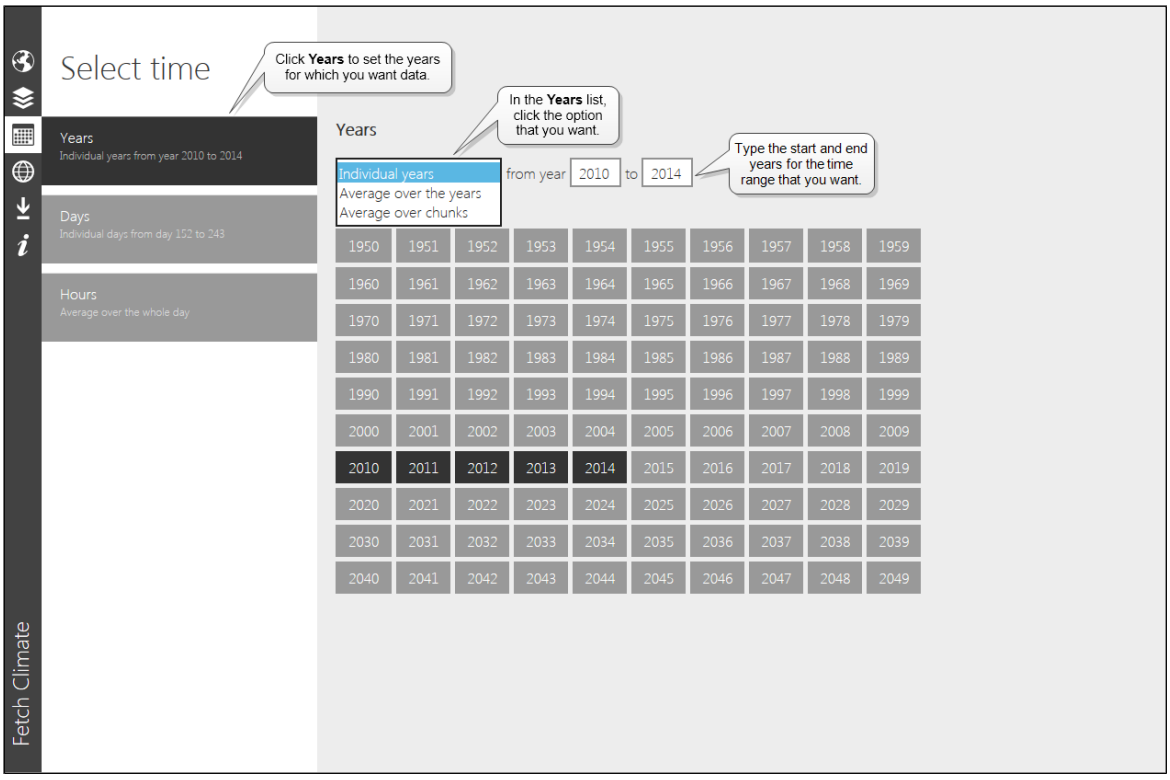
On the **Select time** page, you can select a timeframe that best reflects the data you need. FetchClimate enables multiple time scenarios to span years, days, or even hours.

TIP Some data sources have information down to the hour; others do not. When you set up your query, use a timeframe that reflects the level of detail available in your data source. The more detailed the data you request, the longer it will take for FetchClimate to fetch results, especially if the data doesn't exist at that level. If you need detailed data for multiple data sets, you will get faster results if you run each query separately.

Set a range of years

1. On the left side of the screen, click **Years**.
2. In the **Years** list, click the option that you want.
   You can choose to have the data averaged over the selected years, provided as annual results for each individual year, or averaged over chunks of time—for example, every three years, or every century.
3. Type the start and end years for your range, and the chunk size (if applicable).

NOTE The grid of years is a visual representation of the range of years that you specify, but it cannot be used to set the range.

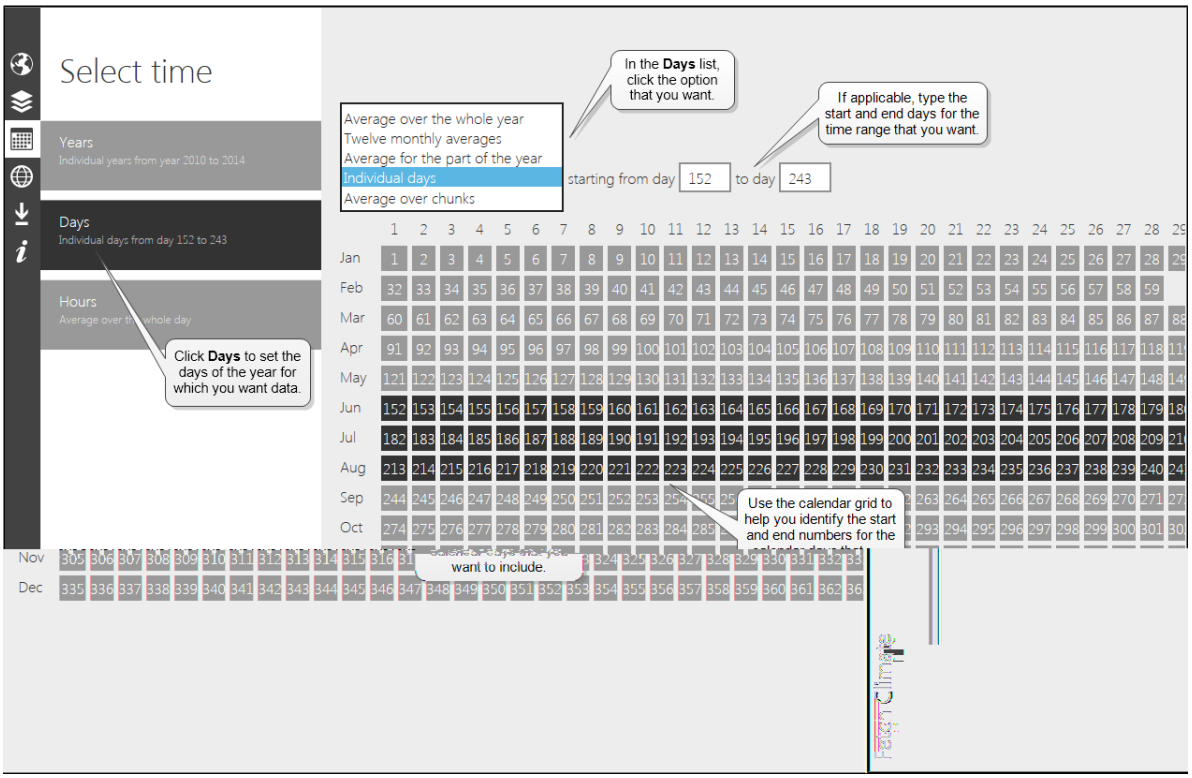


Select the years for which you want FetchClimate to include data

Set a range of days

1. On the left side of the screen, click **Days**.
2. In the **Days** list, click the option that you want.
   You can choose to have the data averaged over the whole year, averaged over each month, averaged over a part of the year, or averaged over chunks of time—for example, every 14 days. You can also select individual days or a range of days.
3. If applicable, type the chunk size and the day range.

TIP Use the calendar grid to help you identify the numbers for the days in the date range that you want. The heading row shows the actual calendar date for each month for easy reference. The calendar grid cannot be used to set the days for which data is retrieved.

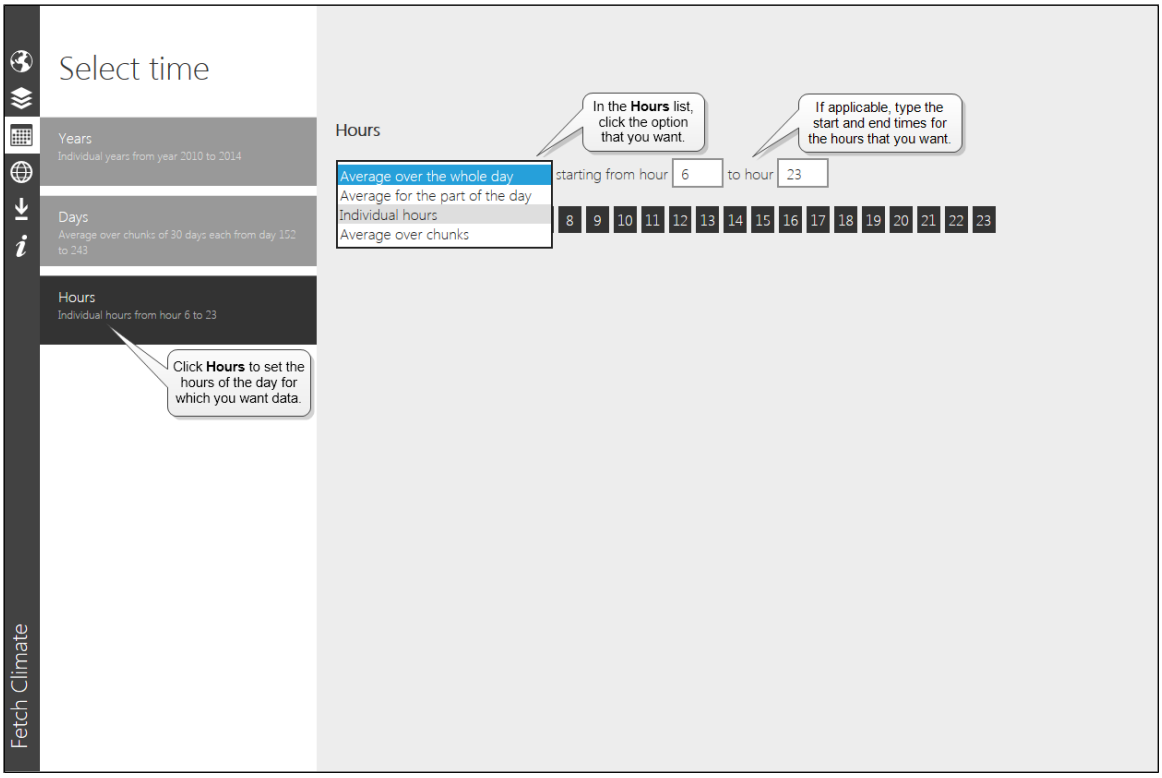


Select the days for which you want FetchClimate to include data

Set hours

1. On the left side of the screen, click **Hours**.
2. In the **Hours** list, click the option that you want.
   You can choose to have data averaged over an entire day, part of the day, or chunks of hours in the day—for example, every six hours starting at 07:00. You can also select individual hours—for example, 08:00 to 20:00.
3. If applicable, set the chunk size and the hour range.

NOTE The hour grid provides a visual representation of the hour range that you specify, but it cannot be used to set the range. Hourly information is not available for all the data sets.



Select the hours for which you want FetchClimate to include data

Step 4: Fetch and view results

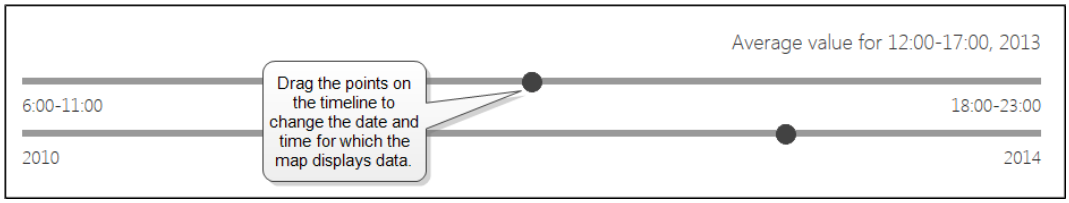
After you have specified the parameters for your query, FetchClimate can generate your results. To start the query, click the **Results** button in the vertical navigation bar on the left side of the screen.

The **View results** page shows your data in a graphical format. When you first click to the page, you will see that FetchClimate is retrieving the results.

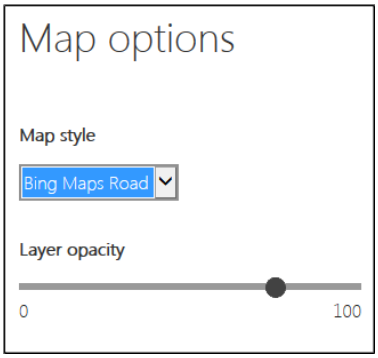
NOTE Depending on the level of detail and amount of data in your query, FetchClimate may take some time to fetch the results.

There are two main views for the View results page: The Layers view and the Details view. In both views for this page, you can:

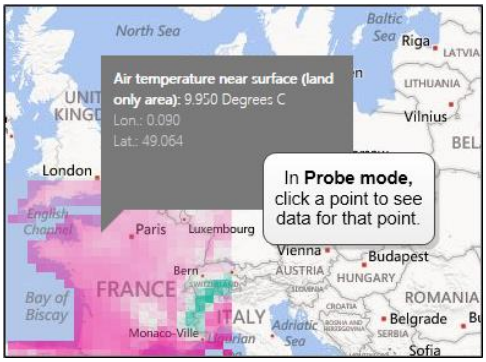
- View the data for a specific point in time reflected on the map by clicking and dragging the timeline point on the interactive timeline below the map.



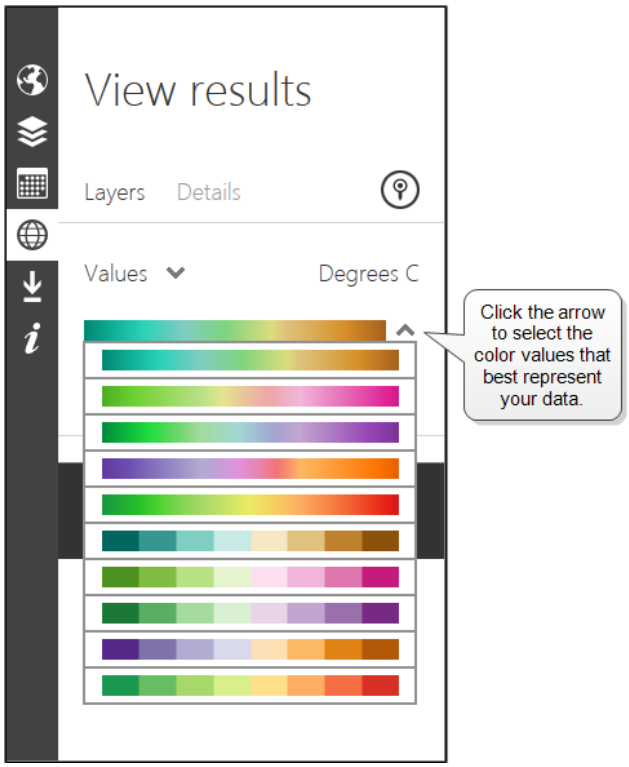
- Change the opacity of the layers on the map, or change the map style, by clicking the **Map options** button.



- Get more details about a specific point of the data shown on the map by clicking the **Probe mode** button. Probe mode enables you to click a point on the map to see data for that point.



- Change the color scheme to best represent your data by clicking the arrow next to the values scale.

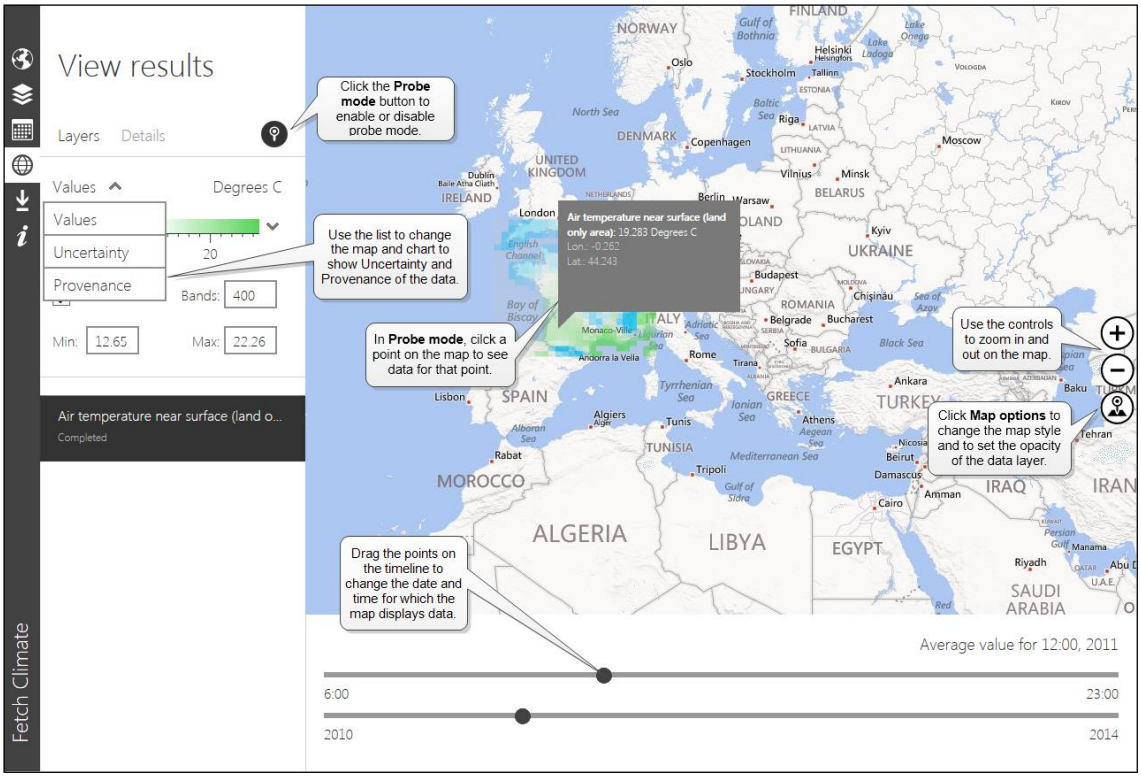


Select the color scheme that best represents your data

Layers view

The Layers view is the default view for the page. It shows the map with your points or region and the data displayed on the map. In the Layers view, you can:

- Change the data set displayed on the map by clicking a data set tile on the left.
- View the data uncertainty on the map.
- View a list of the provenance, or sources, of the data, and see the provenance reflected on the map.

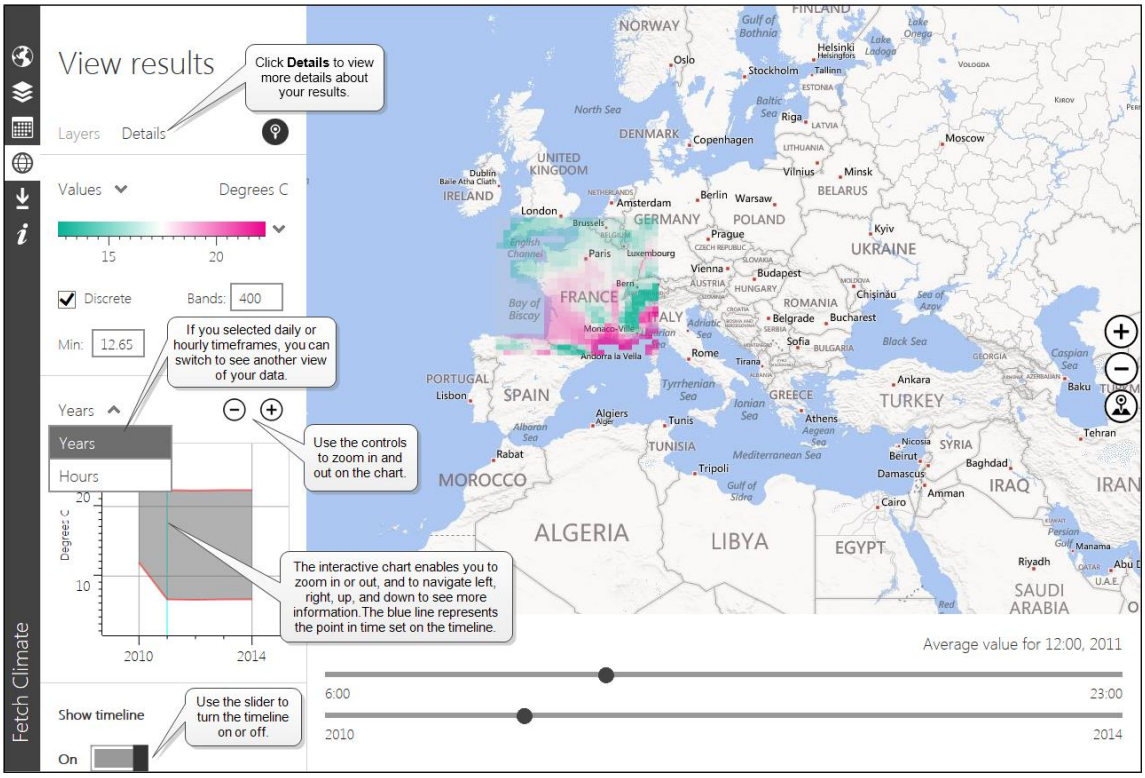


Layers view of the results page

Details view

Click **Details** to see another view of your results. In the Details view, you can:

- Turn the timeline on or off.
- View an interactive chart of the data values.
- View an interactive chart of the data uncertainty, and see the uncertainty values reflected on the map.
- View a list of the data provenance, or sources, and see the provenance reflected on the map.



Details view of the results page

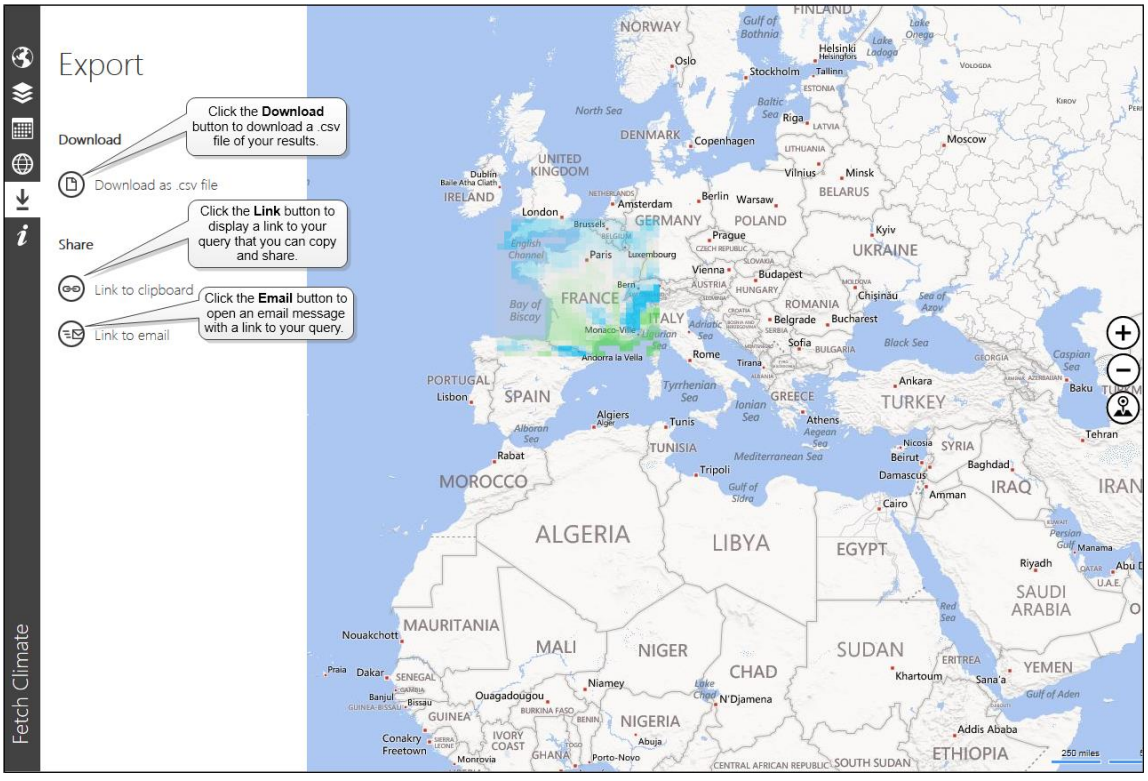
Export

After you have set up a query and fetched the results, you may want to save the information and share it with others. FetchClimate provides three options to help you save and share your results.

Download a .csv file of the data. A .csv file can be imported to Microsoft Excel or another spreadsheet program so that you can review and manipulate the data.

Link to clipboard. Use this option to generate a URL for your query that you can share with others or include in a document or other file. The URL will enable others to see the exact query results that you generated so that they don't have to run a new query.

Link to email. Use this option to send an email message that includes the URL for your query. This link will open a new email message in your default email program. It will automatically include the URL for your query, so that others can view the exact query results that you generated.



Export your results to save or share with others

About the .csv file

When you download a .csv file of your results, you will get a file that contains the data from your query. The top row shows the variables that were part of your query.

If you set a region for your geography, the data will include values such as latmin, latmax, lonmin, and lonmax. This is due to the variations in the resolution of data sets after they are combined. These numbers specify the ranges of minimum and maximum latitude and longitude for tile sizes of listed data set provenance for your selected region.

region	lat	lon	start	end	airt_land (Degrees C)	airt_land_ uncertainty	airt_land_ provenance	latmin	latmax	lonmin	lonmax
Region 1	42.46256	-6.4531	6/1/2010 6:00	8/29/2010 12:00	17.6227589	2.933914	FC1 Variable	42.282	42.64313	-6.801	-6.10521
Region 1	42.46256	-6.4531	6/1/2010 12:00	8/29/2010 18:00	21.72789511	2.933914	FC1 Variable	42.282	42.64313	-6.801	-6.10521
Region 1	42.46256	-6.4531	6/1/2010 18:00	8/30/2010 0:00	19.62704836	2.933914	FC1 Variable	42.282	42.64313	-6.801	-6.10521
Region 1	42.46256	-6.4531	6/1/2011 6:00	8/29/2011 12:00	16.56148281	NaN	FC1 Variable	42.282	42.64313	-6.801	-6.10521
Region 1	42.46256	-6.4531	6/1/2011 12:00	8/29/2011 18:00	16.56148281	NaN	FC1 Variable	42.282	42.64313	-6.801	-6.10521
Region 1	42.46256	-6.4531	6/1/2011 18:00	8/30/2011 0:00	16.56148281	NaN	FC1 Variable	42.282	42.64313	-6.801	-6.10521
Region 1	42.46256	-6.4531	5/31/2012 6:00	8/28/2012 12:00	16.04928395	NaN	FC1 Variable	42.282	42.64313	-6.801	-6.10521
Region 1	42.46256	-6.4531	5/31/2012 12:00	8/28/2012 18:00	16.04928395	NaN	FC1 Variable	42.282	42.64313	-6.801	-6.10521
Region 1	42.46256	-6.4531	5/31/2012 18:00	8/29/2012 0:00	16.04928395	NaN	FC1 Variable	42.282	42.64313	-6.801	-6.10521
Region 1	42.46256	-6.4531	6/1/2013 6:00	8/29/2013 12:00	16.66125634	NaN	FC1 Variable	42.282	42.64313	-6.801	-6.10521
Region 1	42.46256	-6.4531	6/1/2013 12:00	8/29/2013 18:00	16.66125634	NaN	FC1 Variable	42.282	42.64313	-6.801	-6.10521
Region 1	42.46256	-6.4531	6/1/2013 18:00	8/30/2013 0:00	16.66125634	NaN	FC1 Variable	42.282	42.64313	-6.801	-6.10521
Region 1	42.46256	-6.4531	6/1/2014 6:00	8/29/2014 12:00	17.08356343	NaN	FC1 Variable	42.282	42.64313	-6.801	-6.10521

The .csv file shows your query results in a table format

TIP Each query will generate one .csv file—even if you have specified multiple geographies and data sources. This can make it confusing to view the data in a spreadsheet format. To simplify the results, and for faster queries, set up separate queries for the different geographies and data sources.

Frequently Asked Questions

Q. My query is taking a long time to run. What's wrong?

A. FetchClimate is designed to be as efficient as possible. However, depending on the detail level of the data you request, it can take time to fetch the results from multiple large data sets. In addition, FetchClimate performs the necessary regridding in space and time to provide a visualization of the results, which takes time to process. Try these tips to speed things up:

- Make sure that you set the parameters to the level that you need. For example, a query that asks for yearly averages, individual months, or individual hours within a year will take longer.
- Run the query and let it finish. When the query is finished, save the URL so that you can run it again quickly in the future.
- Build up queries. For example, run a query with one data set, then add another, and then another. As long as you do not change the selected regions, the searches for the previous data sets are cached.
- Open the data sets and reduce the number used in your query. Several of the data sets pull from multiple sources. If you trust one source more than others, you can reduce your search time by selecting only that subset of the data sets for a particular variable.

Q. I'm not sure what the buttons do. How can I tell?

A. Point to the button to see screen tip that describes what the button does. This functionality has been enabled for most of the buttons in FetchClimate.

Q. Why did my FetchClimate query fail?

A. Sometimes queries time out—that is, they take too long to complete in a single session. See the suggestions above for ideas on how to reduce the time FetchClimate needs to run your query.

More Information

- FetchClimate website: http://fetchclimate.org
- FetchClimate on Microsoft Research Tools: http://research.microsoft.com/en-us/um/cambridge/groups/science/tools/fetchclimate/default.htm
- Implementation Guide
- User video: http://research.microsoft.com/apps/video/?id=212688