

FetchClimate 2 User Guide

Table of Contents

- FetchClimate Overview 2
 - The challenge 2
 - The FetchClimate solution 2
- Using FetchClimate 3
 -  Step 1: Select geography 3
 - Select a point 4
 - Select a region..... 5
 - Search for a location by name 6
 - Change the map style 6
 -  Step 2: Select information layer 7
 -  Step 3: Select time 9
 - Set a range of years..... 9
 - Set a range of days..... 10
 - Set hours 11
 -  Step 4: Fetch and view results 12
 - Layers view..... 14
 - Details view 15
 -  Export..... 16
 - About the .csv file 17
- Frequently Asked Questions 18
 - Q. My query is taking a long time to run. What’s wrong? 18
 - Q. I’m not sure what the buttons do. How can I tell?..... 18
 - Q. Why did my FetchClimate query fail? 18
- More Information 18

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 regriding 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 regriding 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

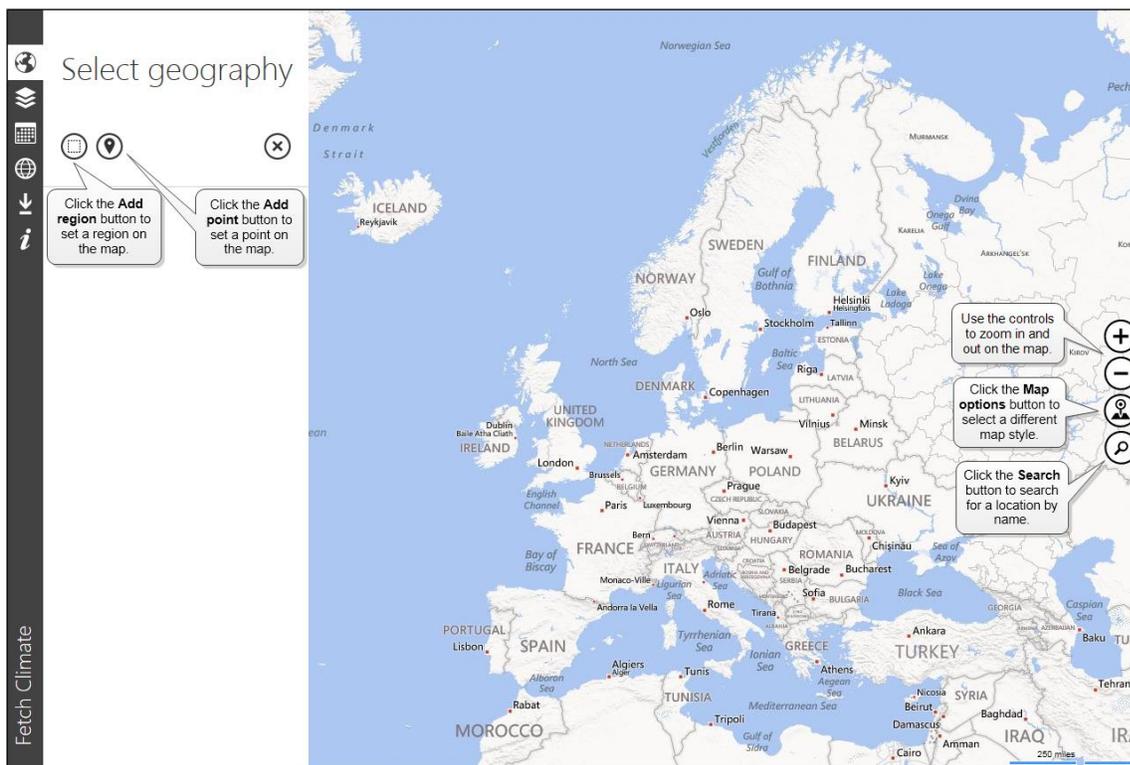
There are four primary steps for using FetchClimate, outlined along the left side of the screen:

-  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.

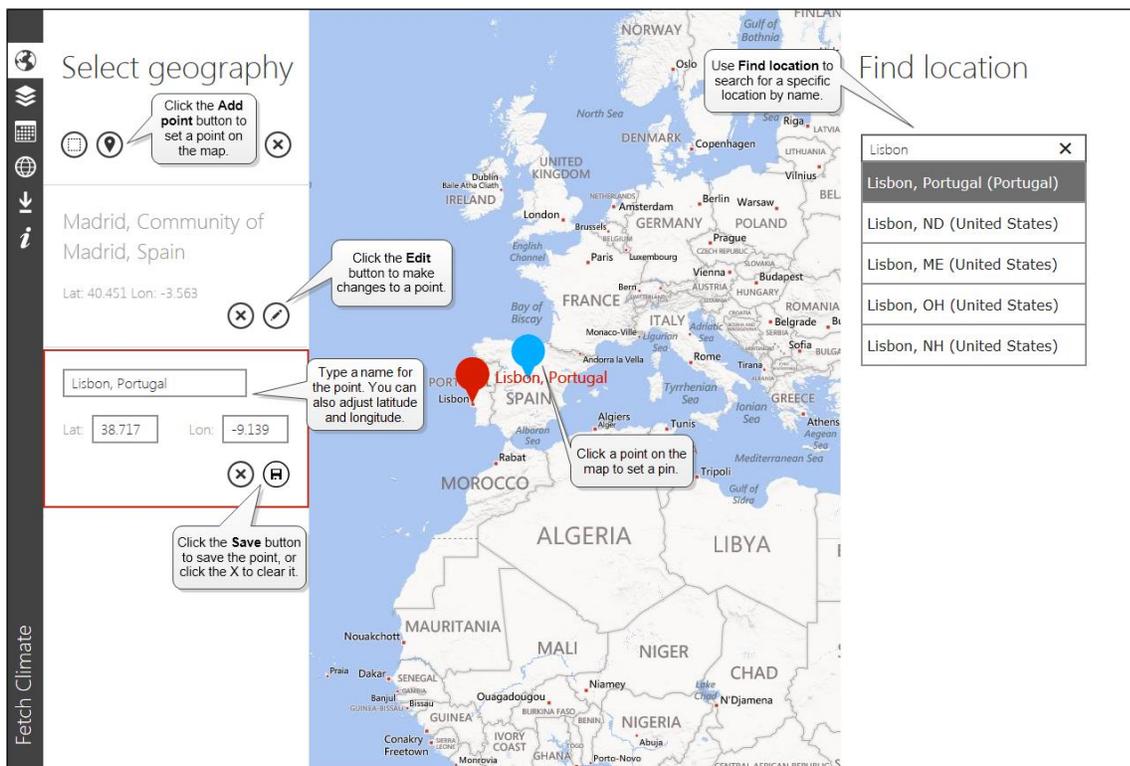


The Select geography page enables you to select points, regions, or a combination of both.

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.



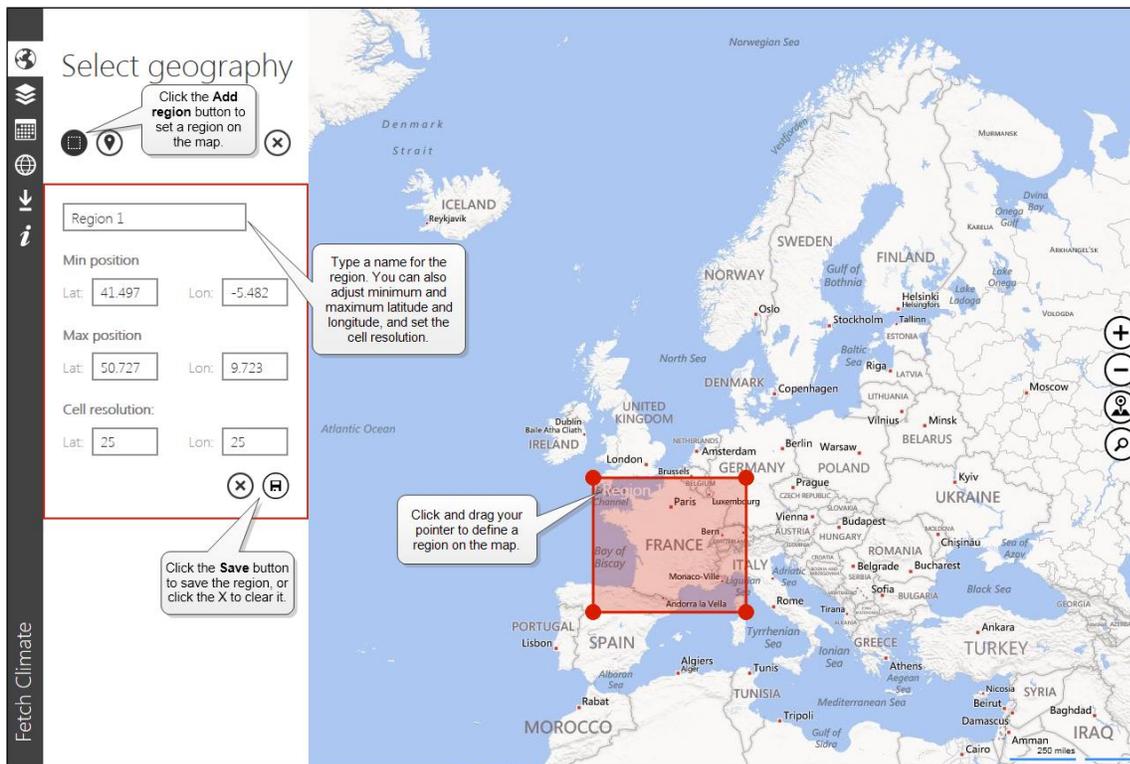
Select points on the map

- 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

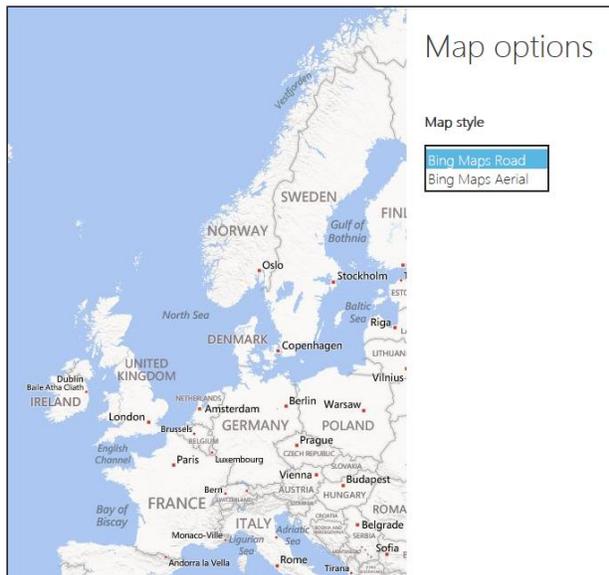
- To delete a region, click the **Remove** button  for that region. To delete all points and regions, click the **Remove** button at the top of the list.
- To make changes to a region, click the **Edit** button  for that region.

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.

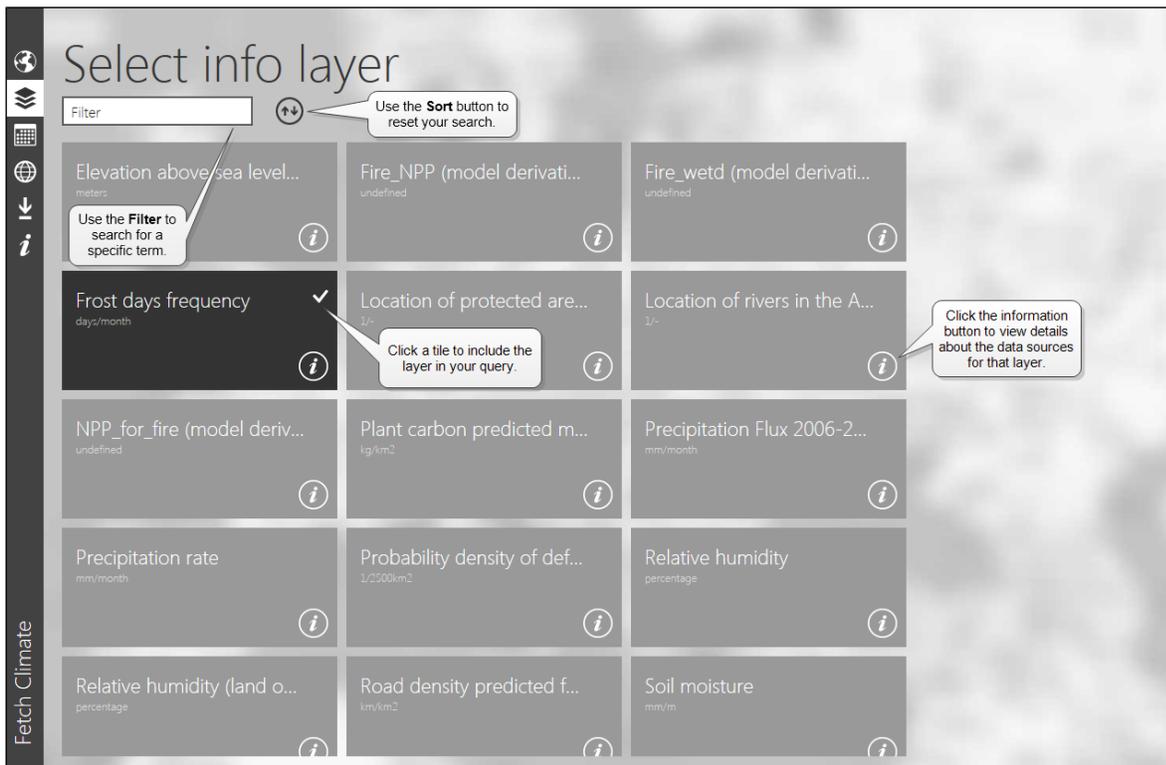


Change the style of the map

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.



The screenshot displays the 'Select info layer' interface. At the top left, there is a search filter and a sort button. Below this is a grid of 15 data layer tiles. The 'Frost days frequency' tile is selected, indicated by a checkmark. Callout boxes provide instructions: 'Use the Filter to search for a specific term.', 'Use the Sort button to reset your search.', 'Click a tile to include the layer in your query.', and 'Click the information button to view details about the data sources for that layer.' The 'Fetch Climate' logo is on the left side.

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.

The screenshot shows the FetchClimate interface for the query 'Air temperature near surface'. The interface includes a search bar, a list of data sources, and a detailed view of the 'WorldClim 1.4' source. The data sources listed are:

- CRU CL 2.0: High-resolution grid of the average climate in the recent past.
- GFDLAvTemp: GFDL Average Daily Temperature Forecast.
- GHCNv2: The Global Historical Climatology Network (GHCN-Monthly) data base contains historical temperature...
- NCEP/NCAR Reanalysis 1...: The NCEP/NCAR Reanalysis 1 project is using a state-of-the-art analysis/forecast system to perform data...
- WorldClim 1.4: A set of global climate layers (climate grids) with a spatial resolution of a square kilometer.

The detailed view for 'WorldClim 1.4' includes the following information:

- Variables:** airt, airt_land, prate
- Copyright:** The database is documented in this article: Hijmans, R.J., S.E. Cameron, J.L. Parra, P.G. Jones and A. Jarvis, 2005. Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology 25: 1965-1978.

A callout box points to the information button on the WorldClim 1.4 tile, stating: 'Click the information button to view details about a specific data source.'

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.

The screenshot shows the 'Select time' interface. On the left, there is a sidebar with three options: 'Years' (Individual years from year 2010 to 2014), 'Days' (Individual days from day 152 to 243), and 'Hours' (Average over the whole day). The 'Years' option is selected. In the main area, there is a 'Years' section with a dropdown menu showing 'Individual years', 'Average over the years', and 'Average over chunks'. Below this is a grid of years from 1950 to 2049. A callout box points to the 'Years' option in the sidebar, saying 'Click Years to set the years for which you want data.' Another callout box points to the 'Individual years' option in the dropdown, saying 'In the Years list, click the option that you want.' A third callout box points to the 'from year 2010 to 2014' input field, saying 'Type the start and end years for the time range that you want.'

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.

The screenshot shows the 'Select time' interface. On the left, the 'Days' option is selected. The main area displays a list of averaging options: 'Average over the whole year', 'Twelve monthly averages', 'Average for the part of the year', 'Individual days', and 'Average over chunks'. The 'Individual days' option is highlighted, and a text box shows 'starting from day 152 to day 243'. Below this is a calendar grid for the year 2014, with a range from day 152 to 243 selected. Callouts provide instructions on using the interface.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Jan	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Feb	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	
Mar	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88
Apr	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
May	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149
Jun	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Jul	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210
Aug	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241
Sep	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272
Oct	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302
Nov	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333
Dec	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363

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.

The screenshot shows the 'Select time' interface in FetchClimate. On the left, there is a vertical sidebar with icons for 'Years', 'Days', and 'Hours'. The 'Hours' option is selected and highlighted in dark grey. A callout bubble points to it with the text: 'Click Hours to set the hours of the day for which you want data.' The main area is titled 'Hours' and contains a list of three options: 'Average over the whole day' (highlighted in blue), 'Average for the part of the day', and 'Average over chunks'. A callout bubble points to this list with the text: 'In the Hours list, click the option that you want.' Below the list, there are two input fields: 'starting from hour' with the value '6' and 'to hour' with the value '23'. A callout bubble points to these fields with the text: 'If applicable, type the start and end times for the hours that you want.' Below the input fields is a horizontal grid of 24 numbered boxes representing hours from 8 to 23. The boxes for hours 8 through 23 are dark grey, while the boxes for hours 6 and 7 are white, indicating the selected range.

Select the hours for which you want FetchClimate to include data

Step 4: Fetch and view results

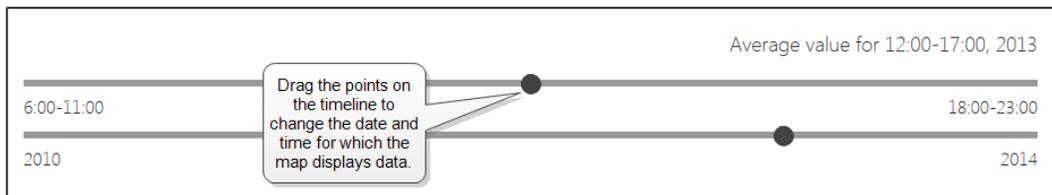
After you have specified the parameters for your query, FetchClimate can generate your results. To start the query, click the **Results** button  in the vertical navigation bar on the left side of the screen.

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.

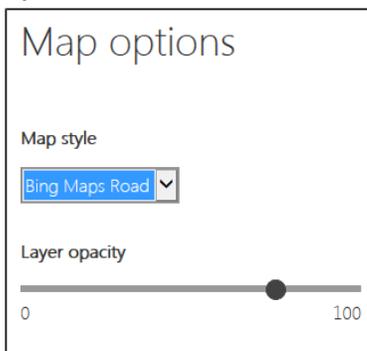
NOTE Depending on the level of detail and amount of data in your query, FetchClimate may take some time to fetch the results.

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:

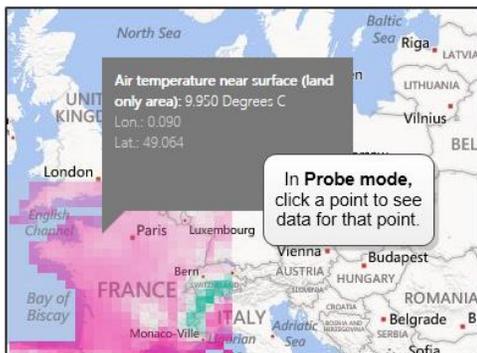
- View the data for a specific point in time reflected on the map by clicking and dragging the timeline point on the interactive timeline below the map.



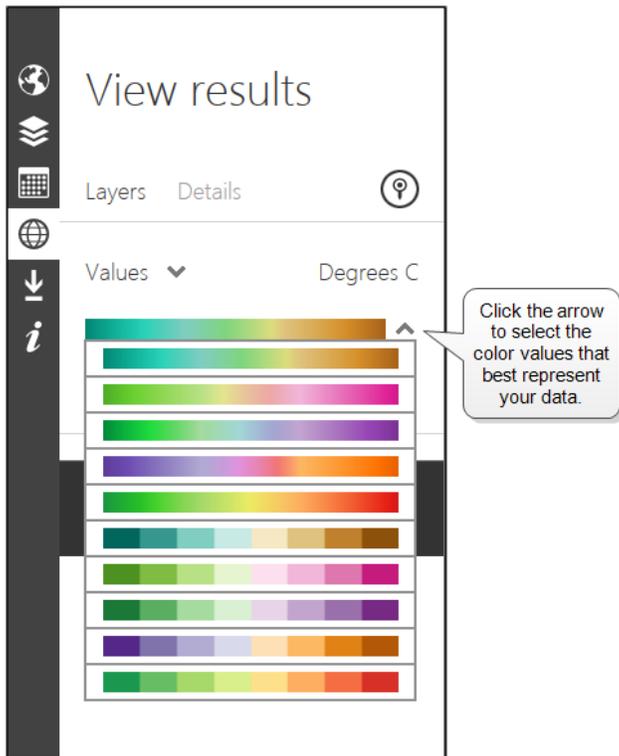
- Change the opacity of the layers on the map, or change the map style, by clicking the **Map options** button .



- 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.

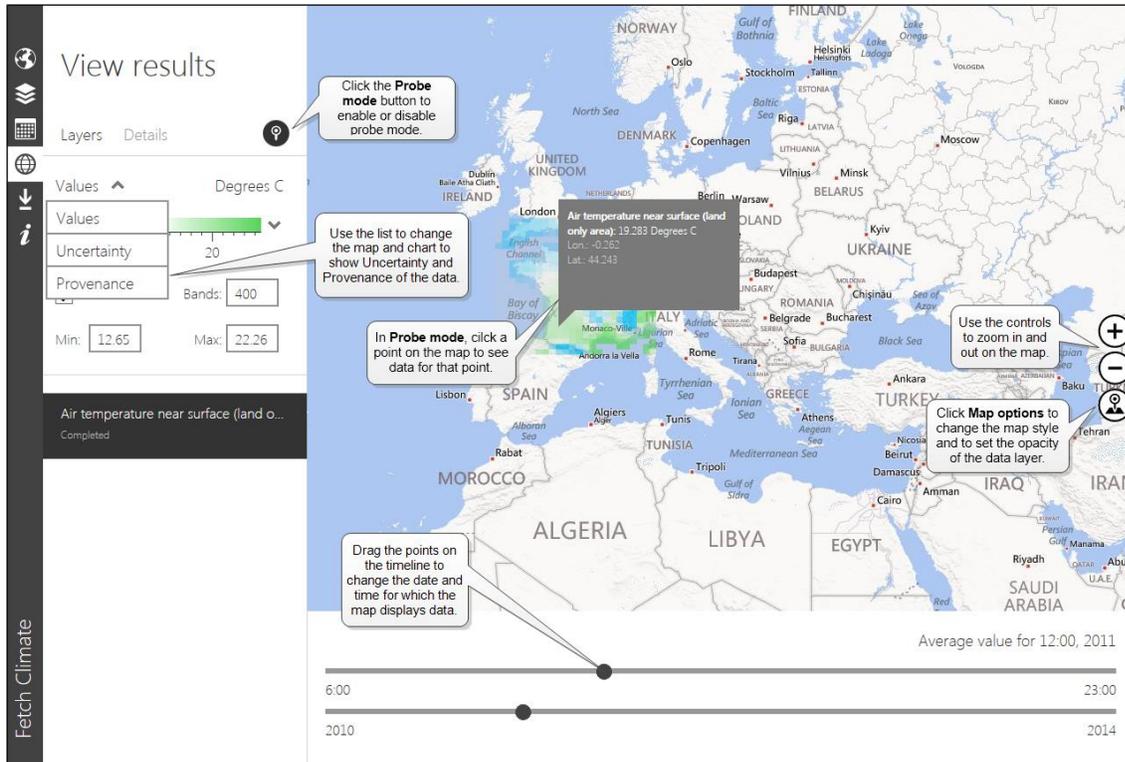


Select the color scheme that best represents your data

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.

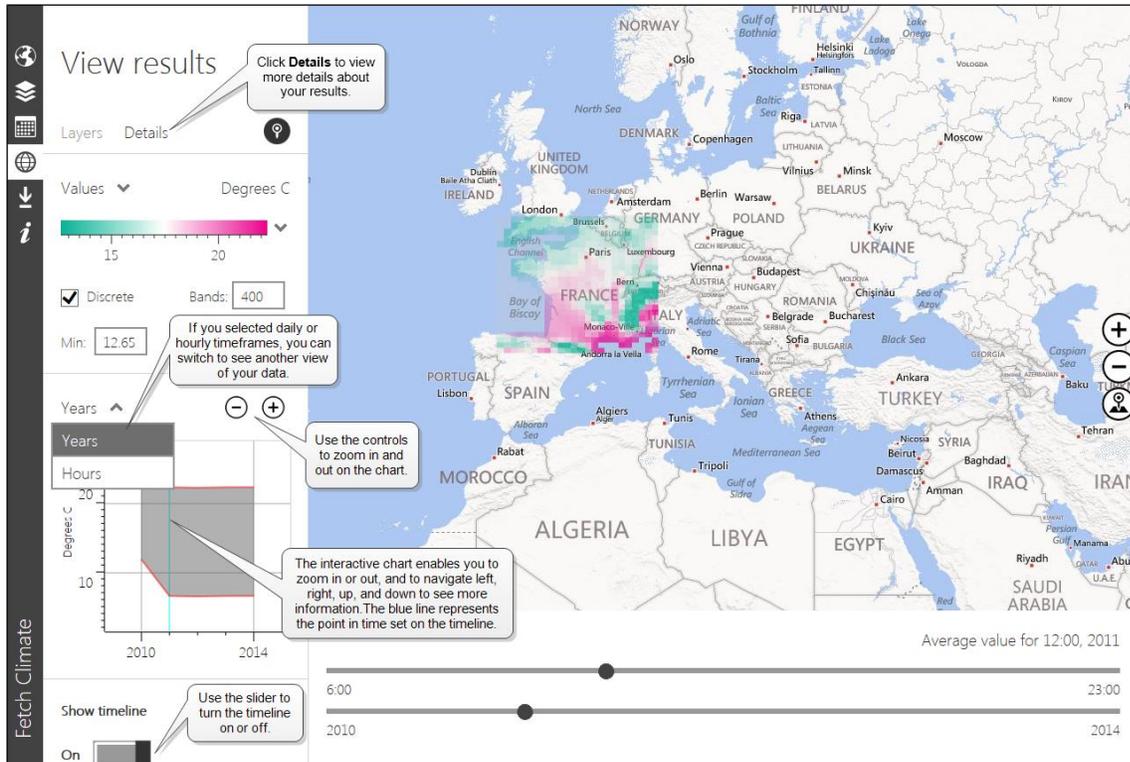


Layers view of the results page

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>

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