User Guide

Year 2024

Version 2.3

drifViewer Matlab Package

Software to extract and analyze data from NOAA drifters

User Manual by

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1 Introduction

1.1 Scope and Purpose

driftViewer is a software to optimize and streamline the exploration of drifter trajectories and the analysis of key oceanographic parameters. By efficiently optimizing the search for trajectories, this software allows researchers to effectively track and predict the motion of ocean drifters, which are crucial for understanding ocean currents, water circulation patterns, and pollutant dispersion. It also facilitates the analysis of oceanographic parameters such as ocean currents and temperature, providing researchers with valuable insights into environmental trends and changes over time.

This user guide allows researchers to learn how to access the software's functionalities, which play crucial roles in the study and analysis of oceanographic parameters obtained from drifter trajectories, such as buoys and floating devices. They provide researchers with powerful tools to investigate environmental changes on different temporal and spatial scales, and contribute to scientific research in oceanography and marine geology by improving the ability to model and predict drifting currents, which is essential for studies on climate change, ocean current dynamics, and marine habitat conservation.

1.2 Process Overview

driftViewer allows to search drifter trajectories and to analyze key oceanographic parameters obtained from those trajectories.

A typical sequence for using the software to manage functions:

1. Configure your workspace
2. Manage a key workflow
3. Troubleshoot

2 Configure your workspace

driftViewer is developed in Matlab 2023b.

How to install

1. Open Matlab.
2. Go to APP tab.
3. Click on the "Install App" button.
4. Select the driftViewer.mlappinstall file.
5. In the Install dialog click on the "Install" button.

Or

```
>> matlab.apputil.install('driftViewer.mlappinstall')
```

How to run

Type in the Matlab command window:

```
>> driftViewer<Enter>
```

or find driftViewer in the APP tab of Matlab.

Original data

The software will create a directory named .datasets in the home directory of the system. The cartographic databases it uses will be stored in this directory. To operate, the software verifies that the databases it needs exist. If not, it connects to the Internet (https://www.aoml.noaa.gov/ftp/pub/phod/buoydata/) and downloads two databases, one corresponding to the coastline and another corresponding to the existing rivers. In this directory there is also a configuration file named *drifterDB.dir,* which contains the path where the drifters' databases are located.

NOTE: This software uses the coastline and river contour data from Wessel and Smith (1996)[1], which are automatically downloaded by the software itself the first time it is run or if it does not find them in its repositories.

3 Manage workflows

Functionalities

- Quick search for drifter trajectories from the AOML dataset[2] in a given geographical region.
- Visualization of data associated to each drifter (ID, the initial and final date and time of the drifter trajectory, and the mean values of the surface current velocity intensity and Sea Surface Temperature (SST)).
- Plot of each trajectory on a map, and the time series of the surface current and SST components.
- Export data from each drifter to separate files in MATLAB and NetCDF format.
- Export the trajectory maps as images in different formats, including the coastline and rivers.

3.1 Open regions of interest

driftViewer allows to search for drifter trajectories from the AOML dataset in a given geographical region. Initially, an interface is enabled that displays an auxiliary window with a progress bar showing the progress in the activation of the initial conditions necessary for the operation of the software (Figure 1).

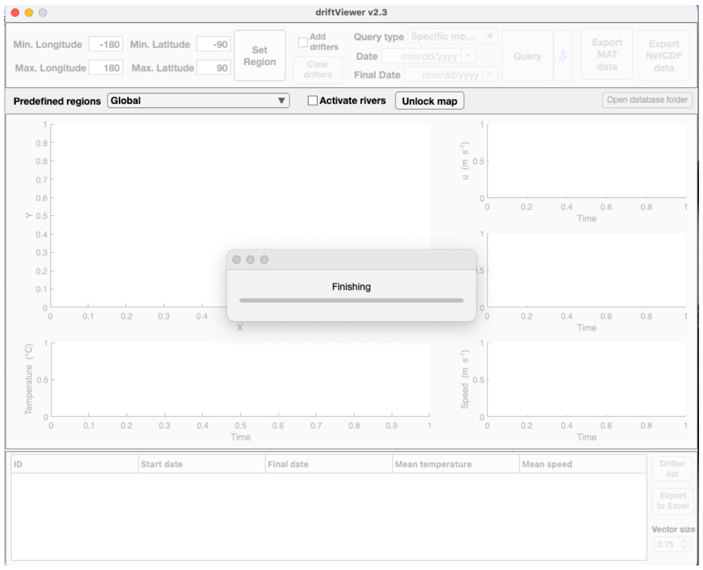


Figure 1. Initial conditions progress bar.

The general interface of the software when it starts running shows a map covering a global region, and several options (Figure 2). The ***Predefined regions*** option allows to choose a region from those predefined in the software (Figure 3).

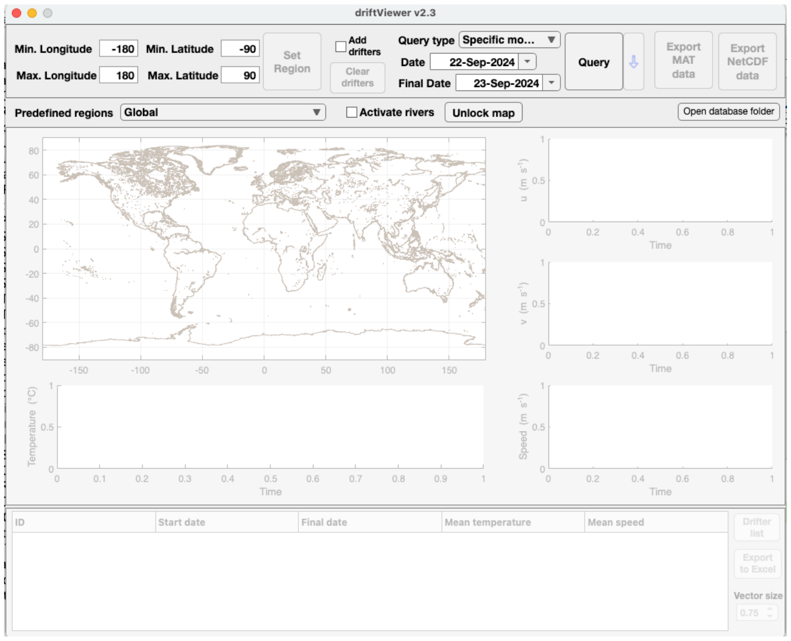


Figure 2. General interface of driftViewer.

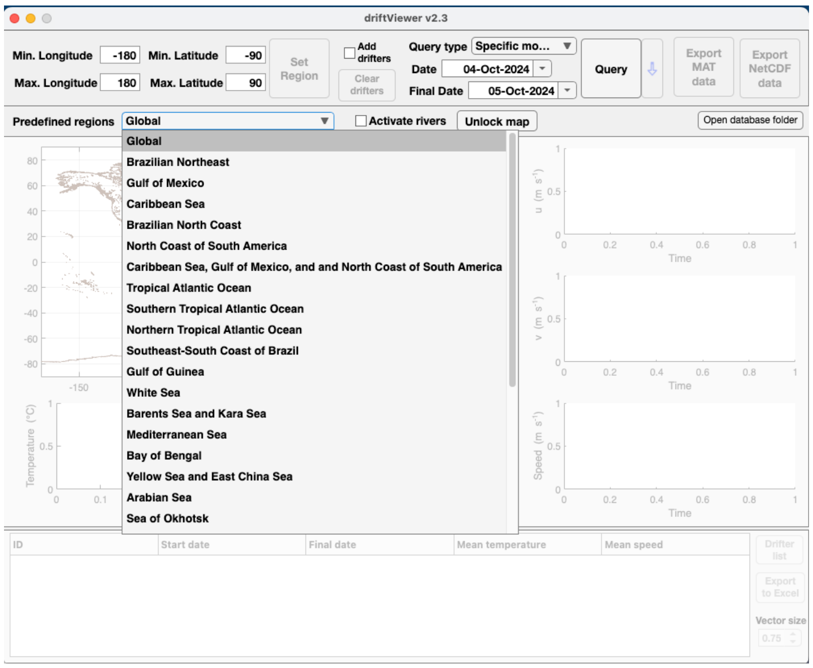
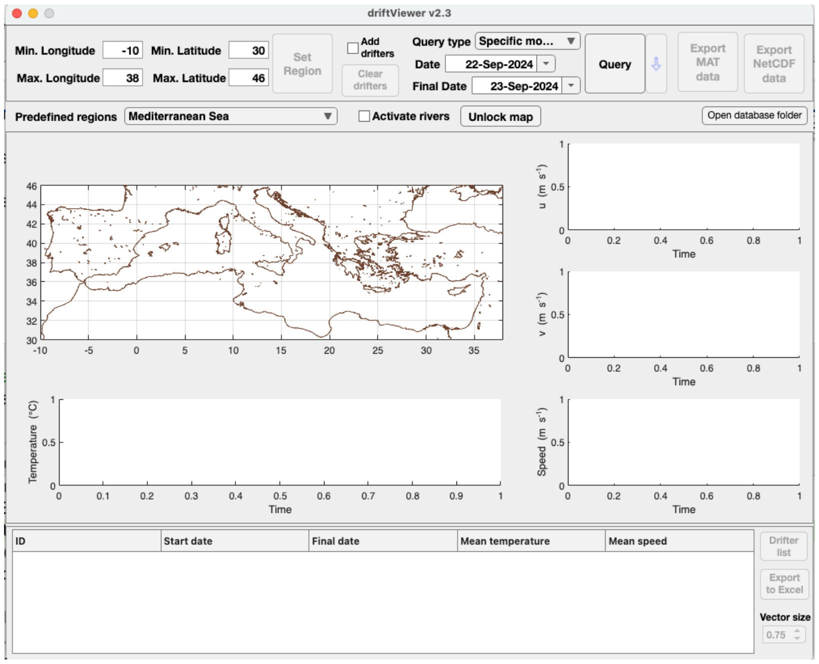


Figure 3. Predefined regions.

Selecting the *Mediterranean Sea* region updates the interface to the corresponding map (Figure 4).

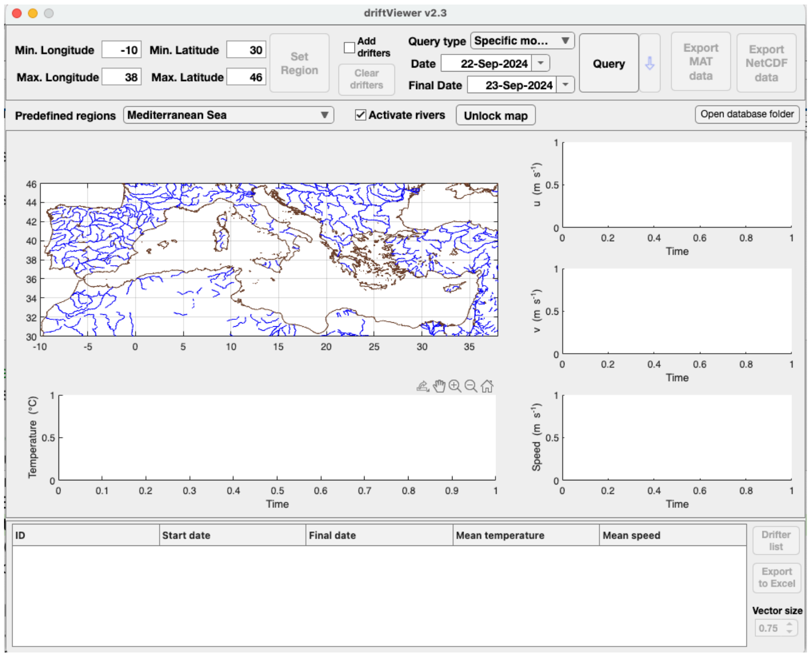


Min. Longitude -10
Max. Longitude 38
Min. Latitude 30
Max. Latitude 46
Query type Specific mo...
Date 22-Sep-2024
Final Date 23-Sep-2024
Predefined regions Mediterranean Sea
☐ Activate rivers
Vector size 0.75

ID	Start date	Final date	Mean temperature	Mean speed

Figure 4. Mediterranean Sea predefined region.

The ***Activate rivers*** option is initially unchecked, when activated all rivers in the region displayed on the map are shown (Figure 5).

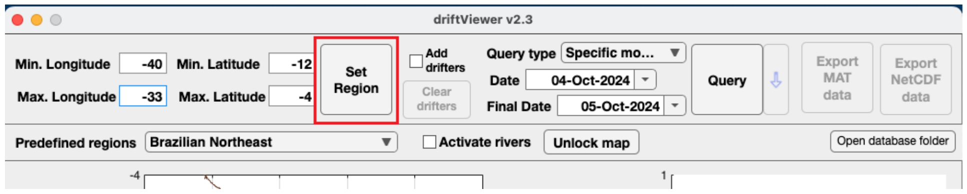


Min. Longitude -10
Max. Longitude 38
Min. Latitude 30
Max. Latitude 46
Query type Specific mo...
Date 22-Sep-2024
Final Date 23-Sep-2024
Predefined regions Mediterranean Sea
☑ Activate rivers
Vector size 0.75

ID	Start date	Final date	Mean temperature	Mean speed

Figure 5. Mediterranean Sea region with its rivers.

The longitude and latitude values defined for a region can be updated to custom values according to the user's interest. Initially the ***Set Region*** button is disabled (Figure 6), every time the longitude and latitude values are changed this button becomes enabled, and allows updating the new desired location.

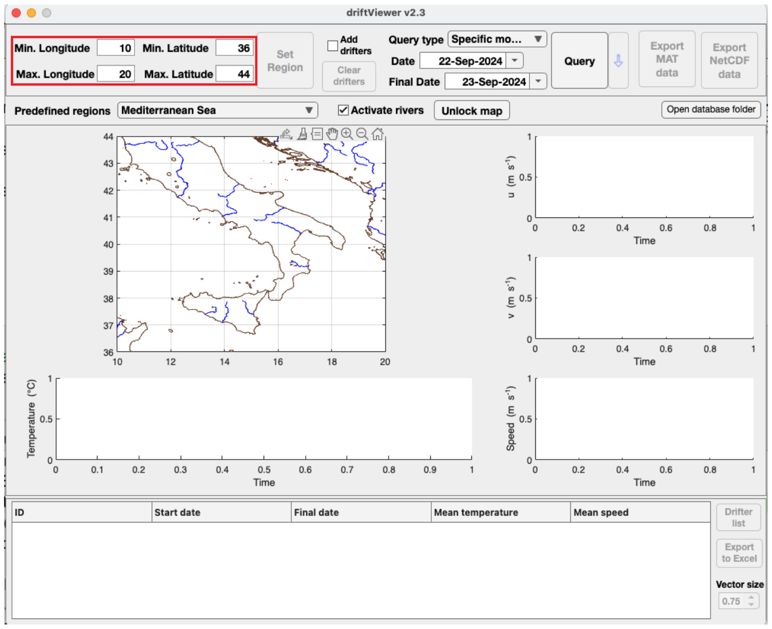


driftViewer v2.3

Min. Longitude -40 Min. Latitude -12
Max. Longitude -33 Max. Latitude -4
Query type Specific mo...
Date 04-Oct-2024
Final Date 05-Oct-2024
Predefined regions Brazilian Northeast

Figure 6. *Set Region* button.

For example, to study the region corresponding to Italy, the longitude and latitude values can be updated to those corresponding to this region, within the default *Meditarrean Sea* region. Figure 7 shows in red the section where longitude and latitude values can be updated, and the map displayed for the specified values, in this case the country of Italy within the *Mediterranean Sea* region.



driftViewer v2.3

Min. Longitude 10 Min. Latitude 36
Max. Longitude 20 Max. Latitude 44
Query type Specific mo...
Date 22-Sep-2024
Final Date 23-Sep-2024
Predefined regions Mediterranean Sea
Activate rivers ✓
Vector size 0.75

ID	Start date	Final date	Mean temperature	Mean speed

Figure 7. Region customization within Mediterranean Sea.

The displayed maps have buttons in the upper right corner, which allow you to increase or decrease the size of the displayed region, as well as move the map in the desired directions simply by holding down the pointer. Figure 8 shows the buttons associated with the displayed map.

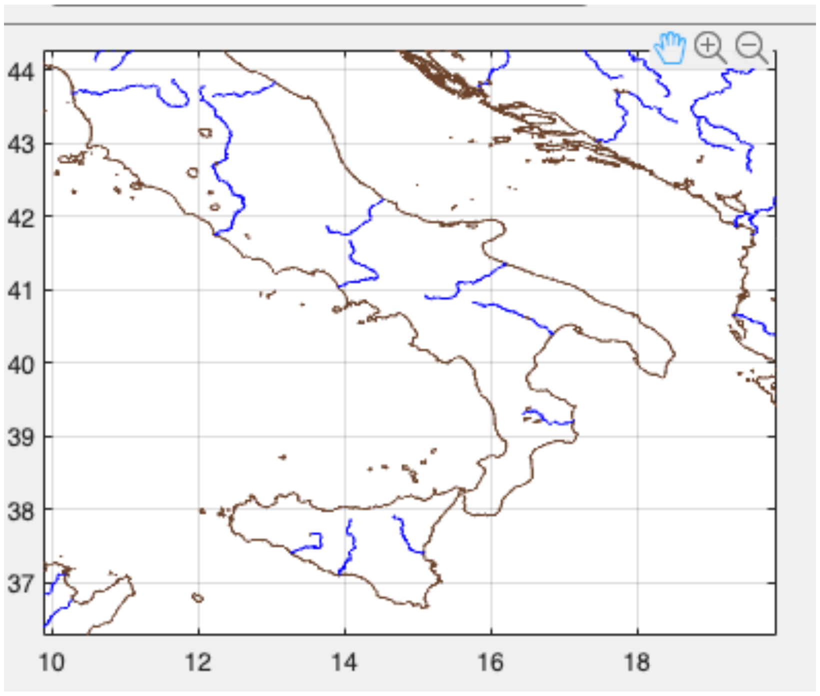
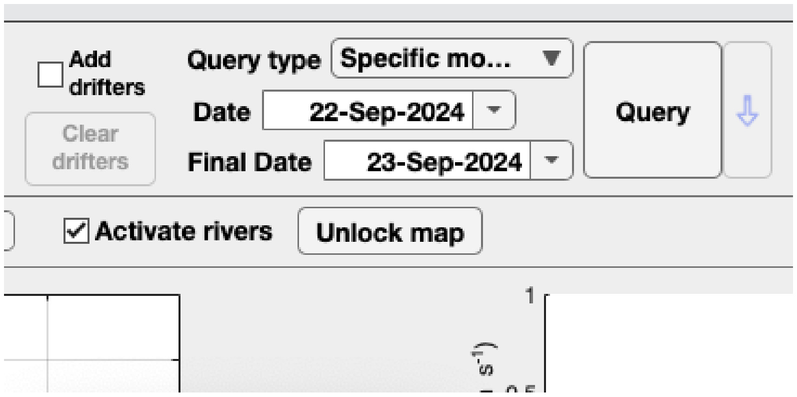


Figure 8. Customization buttons associated with the displayed map.

3.2 Searching data of interest

To analyze the behavior of the drifters of interest, it is necessary to define a date or date range. The space corresponding to ***Date*** and ***Final Date*** allows this function to be performed. An example is shown in Figure 9.



☐ Add drifters

Query type: Specific mo...
Date: 22-Sep-2024
Final Date: 23-Sep-2024

☑ Activate rivers

Unlock map

Figure 9. Options to define Date and Final Date of behavioral analysis in the software.

In both cases, it is possible to choose the date in a date picker box, an example is shown in Figure 10.

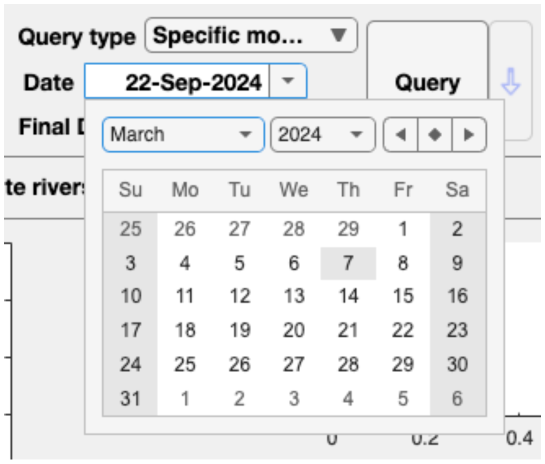
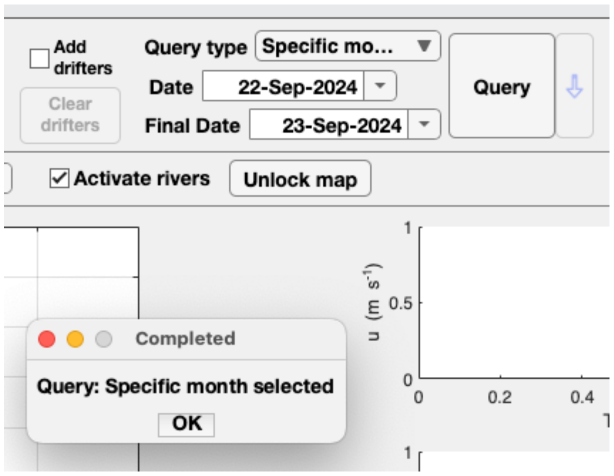


Figure 10. Date picker box to define dates in the software.

The type of query to be performed to retrieve the data corresponding to the drifters of interest is set in ***Query type***, where four possible types of queries can be defined: by day, by week, by month and by date range. The queries in each case are detailed below:

4. By day: the data corresponding to all days equal to the one defined in ***Date*** is retrieved, within the available data.
5. By week: the data corresponding to all weeks equal to the one corresponding to the day defined in ***Date*** is retrieved, within the available data.
6. By month: the data corresponding to all months equal to the one defined in ***Date*** is retrieved, within the available data.
7. By date range: Retrieves the data available for the date range set in ***Date*** and ***Final Date***.

Figure 11 shows the table resulting from determining the execution of a query by month, that is, the *Specific Month* query.



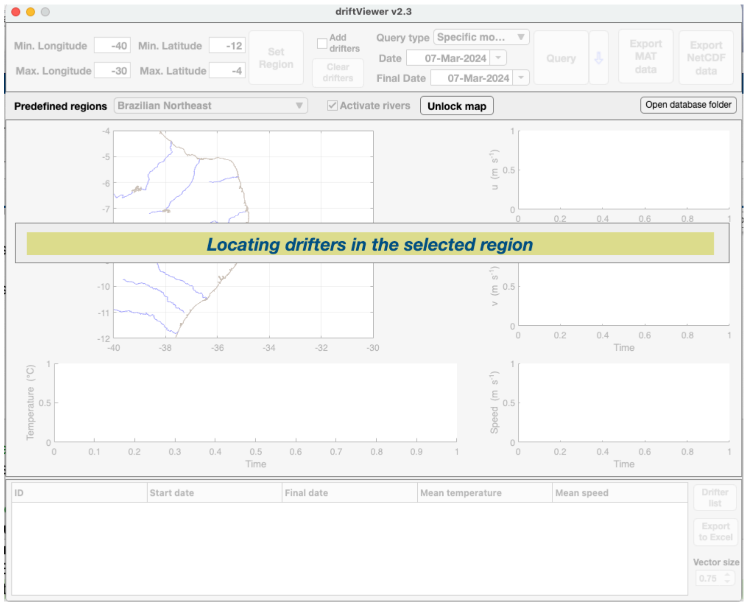
Query type: Specific mo...
Date: 22-Sep-2024
Final Date: 23-Sep-2024
☑ Activate rivers

Completed

Query: Specific month selected

Figure 11. Selection of query to be performed.

After determining the date and type of query to be performed, the query is performed by clicking the ***Query*** button. During the query execution time, a message is displayed on the interface (Figure 12).



Min. Longitude: -40
Min. Latitude: -12
Max. Longitude: -30
Max. Latitude: -4
Query type: Specific mo...
Date: 07-Mar-2024
Final Date: 07-Mar-2024
Predefined regions: Brazilian Northeast
☑ Activate rivers

Locating drifters in the selected region

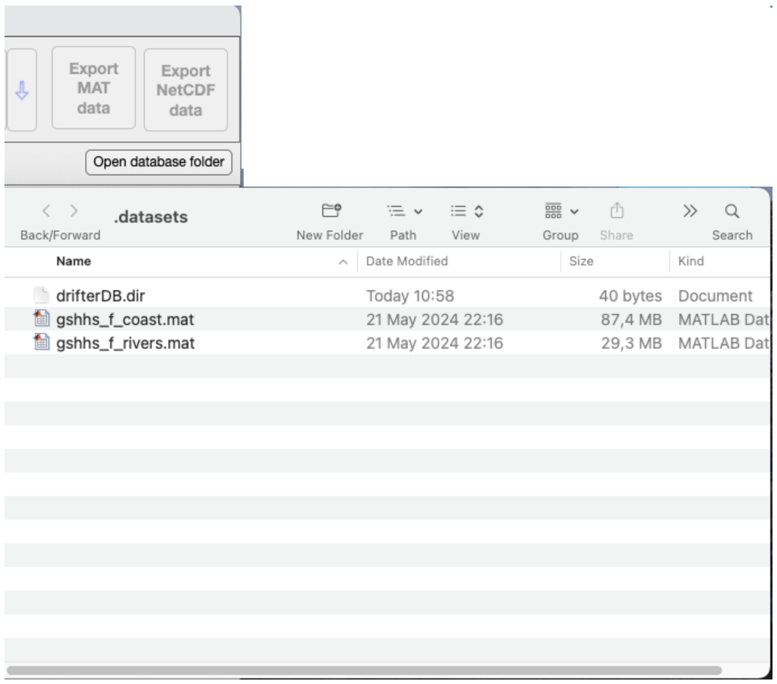
ID	Start date	Final date	Mean temperature	Mean speed

Vector size: 0.75

Figure 12. Search for drifters corresponding to the month of March, according to the defined date.

3.3 Analyzing data of interest

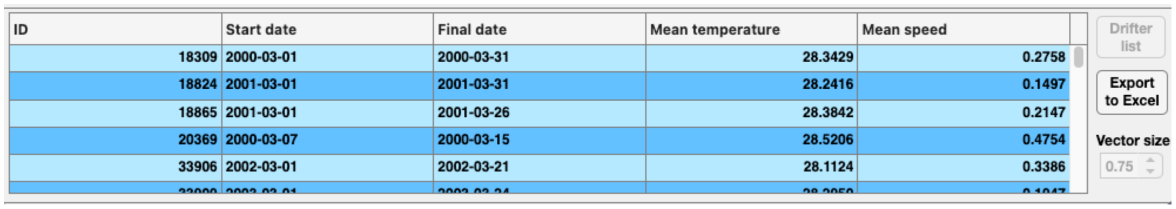
The query retrieves all existing drifters with data reported in the month determined by ***Date***, in this case March, for both coastline and rivers. These data are stored in a table for each type, and the software allows each table to be viewed by choosing the one of interest in the Open Data Folder button. Figure 13 shows the files obtained.



Name	Date Modified	Size	Kind
drifterDB.dir	Today 10:58	40 bytes	Document
gshhs_f_coast.mat	21 May 2024 22:16	87,4 MB	MATLAB Dat
gshhs_f_rivers.mat	21 May 2024 22:16	29,3 MB	MATLAB Dat

Figure 13. Files resulting from the query performed.

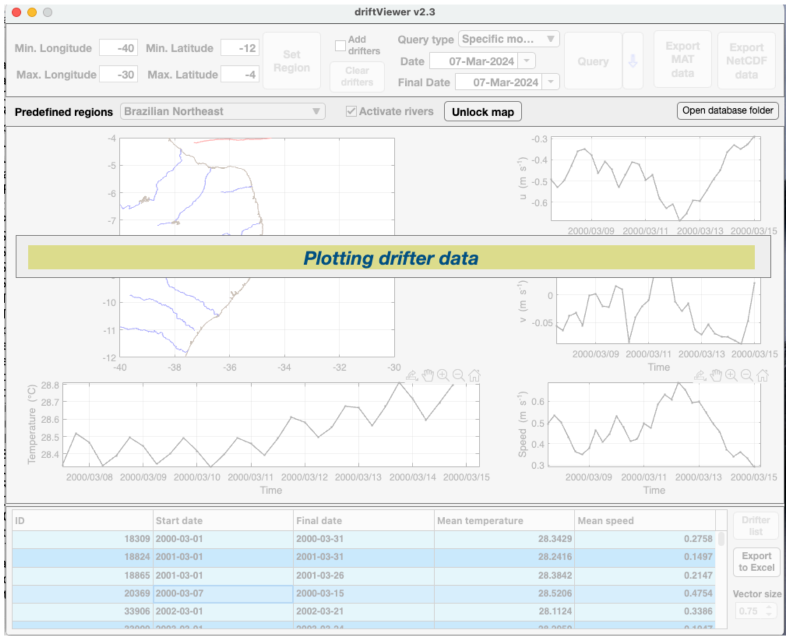
By choosing one of the two files, the data is displayed in a table format, at the bottom of the interface shown in Figure 12. Figure 14 shows the resulting table, corresponding to the ***gshhs_f_coast.mat*** file.



ID	Start date	Final date	Mean temperature	Mean speed
18309	2000-03-01	2000-03-31	28.3429	0.2758
18824	2001-03-01	2001-03-31	28.2416	0.1497
18865	2001-03-01	2001-03-26	28.3842	0.2147
20369	2000-03-07	2000-03-15	28.5206	0.4754
33906	2002-03-01	2002-03-21	28.1124	0.3386

Figure 14. Data retrieved from drifters according to the query performed.

To view the data corresponding to a drifter, it is necessary to select the row corresponding to the drifter of interest in the data table. Figure 15 shows the highlighted cell corresponding to the date of the drifter with ID 20369, and the message that the software displays while the processing of the data associated with this drifter is executed.



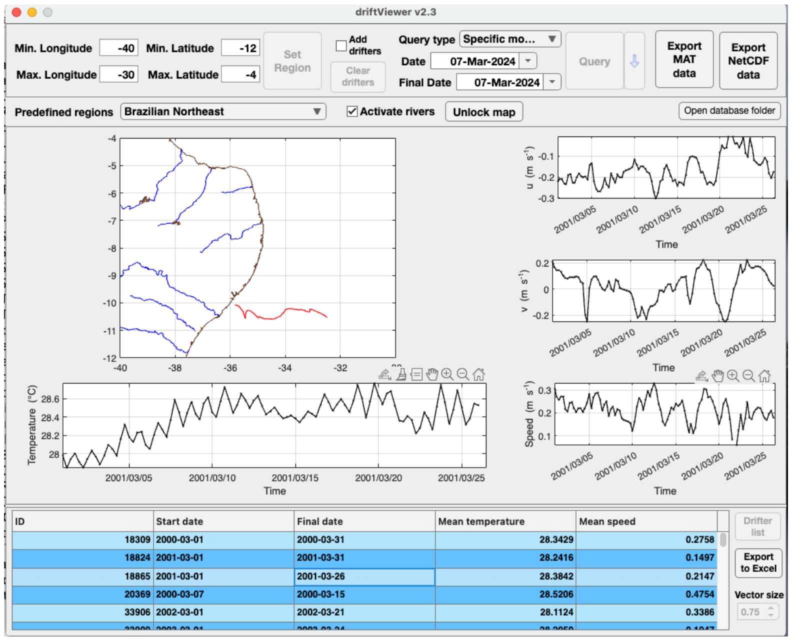
Min. Longitude -40 Min. Latitude -12
Max. Longitude -30 Max. Latitude -4
Query type: Specific mo...
Date: 07-Mar-2024
Final Date: 07-Mar-2024
Predefined regions: Brazilian Northeast
[✓] Activate rivers
Vector size: 0.75

Plotting drifter data

ID	Start date	Final date	Mean temperature	Mean speed
18309	2000-03-01	2000-03-31	28.3429	0.2758
18824	2001-03-01	2001-03-31	28.2416	0.1497
18865	2001-03-01	2001-03-26	28.3842	0.2147
20369	2000-03-07	2000-03-15	28.5206	0.4754
33906	2002-03-01	2002-03-21	28.1124	0.3386

Figure 15. Plotting drifter data.

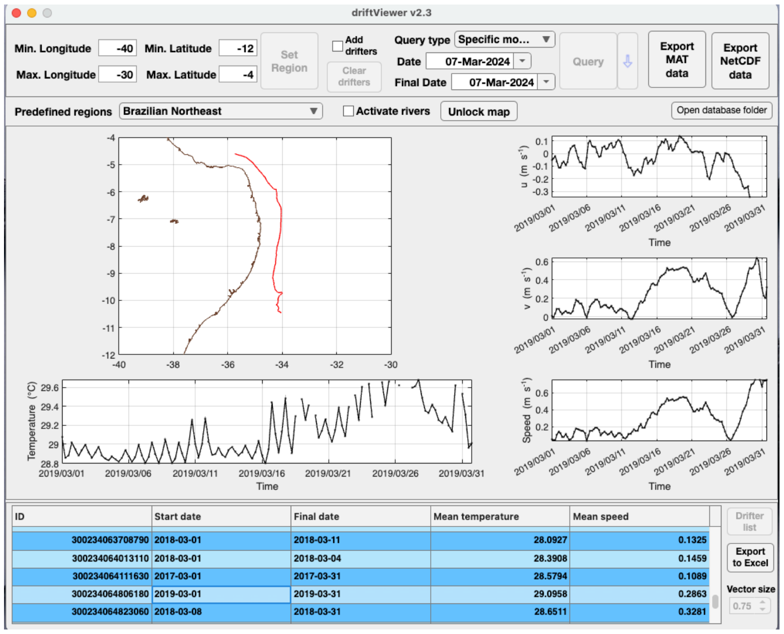
Figures 16 and 17 show examples of the obtained drifters, with the trajectory followed by them. In addition, the data associated with the drifter and the data of each measured variable are shown: ID of the drifter, the initial and final dates of data transmission from this drifter within the period that has been recovered, and the average temperature and speed of the entire trajectory.



Min. Longitude -40 Min. Latitude -12
Max. Longitude -30 Max. Latitude -4
Query type Specific mo...
Date 07-Mar-2024
Final Date 07-Mar-2024
Predefined regions Brazilian Northeast
[✓] Activate rivers
Vector size 0.75

ID	Start date	Final date	Mean temperature	Mean speed
18309	2000-03-01	2000-03-31	28.3429	0.2758
18824	2001-03-01	2001-03-31	28.2416	0.1497
18865	2001-03-01	2001-03-26	28.3842	0.2147
20369	2000-03-07	2000-03-15	28.5206	0.4754
33906	2002-03-01	2002-03-21	28.1124	0.3386

Figure 16. Visualization of data associated with the drifter with ID 18865.

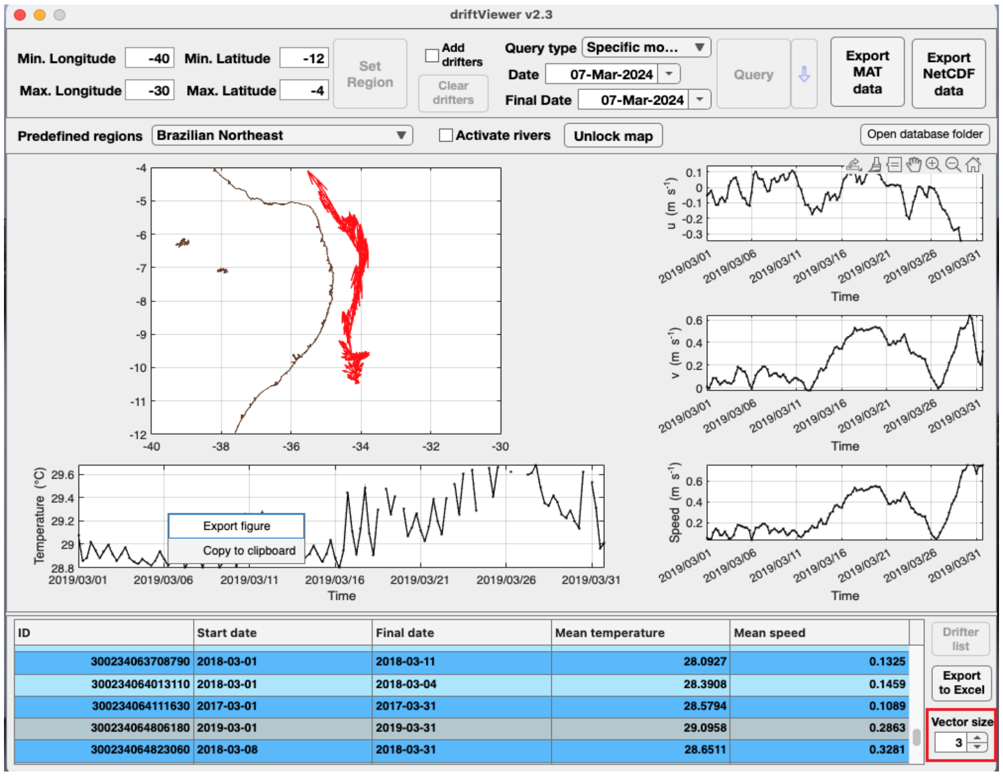


Min. Longitude -40 Min. Latitude -12
Max. Longitude -30 Max. Latitude -4
Query type Specific mo...
Date 07-Mar-2024
Final Date 07-Mar-2024
Predefined regions Brazilian Northeast
[ ] Activate rivers
Vector size 0.75

ID	Start date	Final date	Mean temperature	Mean speed
300234063708790	2018-03-01	2018-03-11	28.0927	0.1325
300234064013110	2018-03-01	2018-03-04	28.3908	0.1459
300234064111630	2017-03-01	2017-03-31	28.5794	0.1089
300234064806180	2019-03-01	2019-03-31	29.0958	0.2863
300234064823060	2018-03-08	2018-03-31	28.6511	0.3281

Figure 17. Visualization of data associated with the drifter with ID 300234064806180.

To view the vectors associated with the drifter's trajectory, it is necessary to define the size of the vectors, in ***Vector size***, which by default is 0.75. Figure 18 shows the vectors associated with the drifter's trajectory displayed in Figure 17, and the ***Vector size*** variable, which has been set to 3 to display a larger size of the vectors. In addition, the contextual menu is shown that allows the figure showing the temperature series of this drifter to be exported as an image. The ***Export to Excel*** button allows the summary table of data retrieved in the search to be exported to xls format.



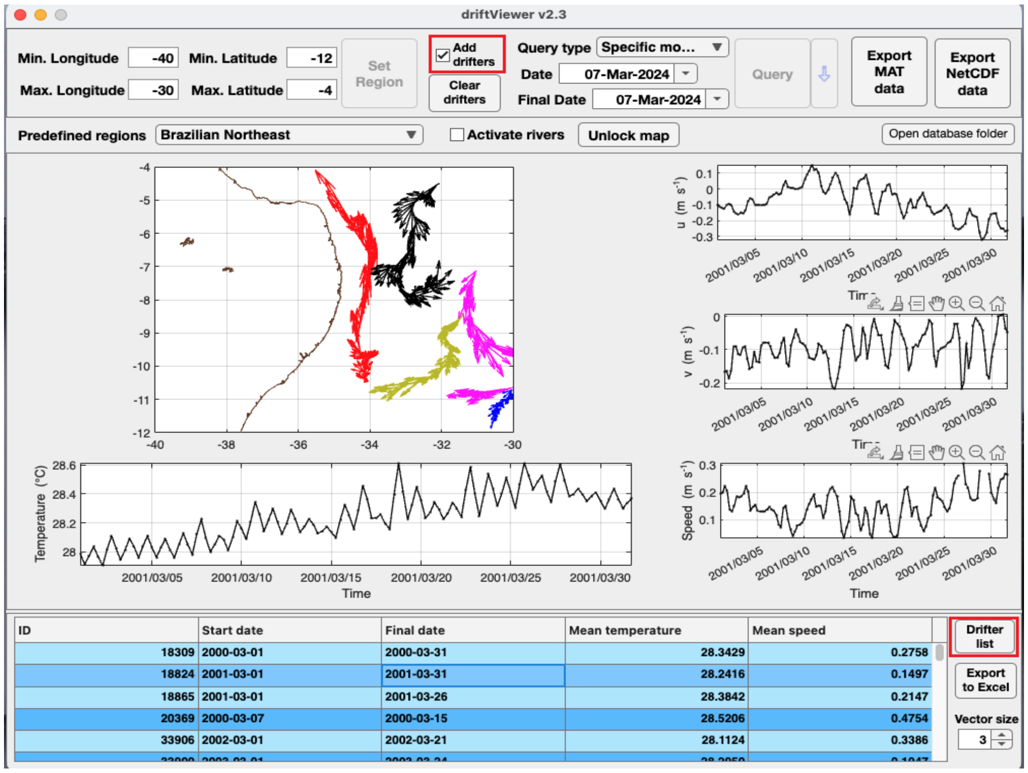
Min. Longitude -40 Min. Latitude -12
Max. Longitude -30 Max. Latitude -4
Query type Specific mo...
Date 07-Mar-2024
Final Date 07-Mar-2024
Predefined regions Brazilian Northeast
Vector size 3

ID	Start date	Final date	Mean temperature	Mean speed
300234063708790	2018-03-01	2018-03-11	28.0927	0.1325
300234064013110	2018-03-01	2018-03-04	28.3908	0.1459
300234064111630	2017-03-01	2017-03-31	28.5794	0.1089
300234064806180	2019-03-01	2019-03-31	29.0958	0.2863
300234064823060	2018-03-08	2018-03-31	28.6511	0.3281

Figure 18. Vectors associated with the trajectory of the drifter with ID 300234064806180.

3.4 Adding more drifters

At the top of the interface there is a box that is disabled by default, ***Add drifters***. By activating this check box, it is possible to add other existing drifters within the retrieved data set, which will be displayed on the same displayed map. The series figures shown always correspond to the last drifter added. Figure 19 shows an example where several trajectories have been added to be displayed together with the initial one, in addition to the ***Add Drifters*** option activated. The trajectory of the initial drifter will always be shown in red. When the ***Add Drifters*** check box is activated, the data shown in the UIAxes are those of the last trajectory (drifter) selected, which in turn are the only data that can be exported in MATLAB and NetCDF files.

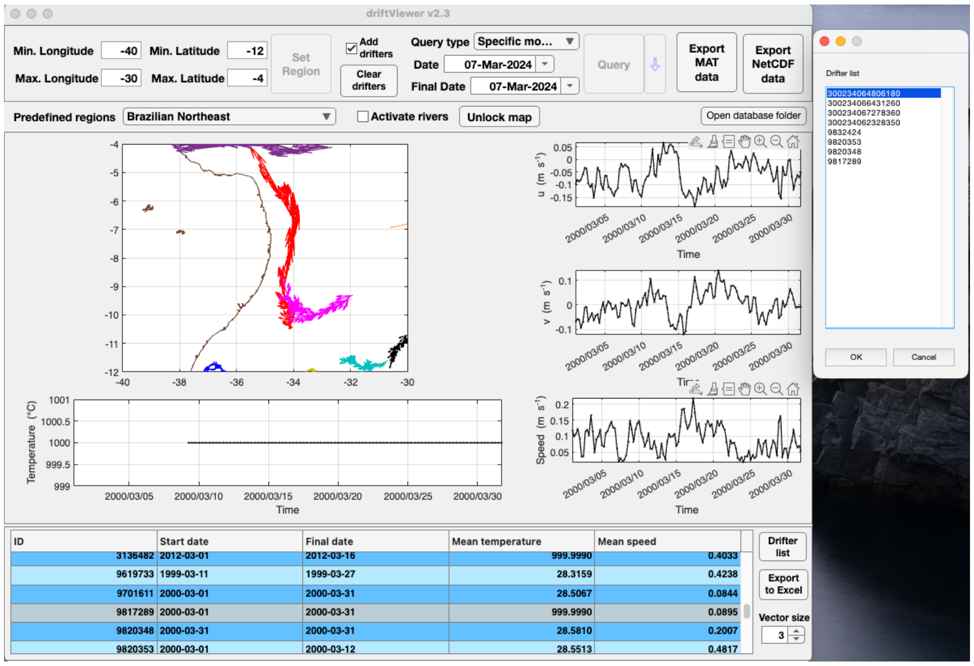


Min. Longitude -40 Min. Latitude -12
Max. Longitude -30 Max. Latitude -4
[✓ Add drifters]
Query type Specific mo...
Date 07-Mar-2024
Final Date 07-Mar-2024
Predefined regions Brazilian Northeast
Vector size 3

ID	Start date	Final date	Mean temperature	Mean speed
18309	2000-03-01	2000-03-31	28.3429	0.2758
18824	2001-03-01	2001-03-31	28.2416	0.1497
18865	2001-03-01	2001-03-26	28.3842	0.2147
20369	2000-03-07	2000-03-15	28.5206	0.4754
33906	2002-03-01	2002-03-21	28.1124	0.3386

Figure 19. Several trajectories added to the initial analysis.

This option also activates a ***Drifter List*** button, shown in red in Figure 19, which allows you to view a list of all the drifters currently displayed. An example is shown in Figure 20.



Min. Longitude -40 Min. Latitude -12
Max. Longitude -30 Max. Latitude -4
[✓ Add drifters]
Query type Specific mo...
Date 07-Mar-2024
Final Date 07-Mar-2024
Predefined regions Brazilian Northeast
Vector size 3

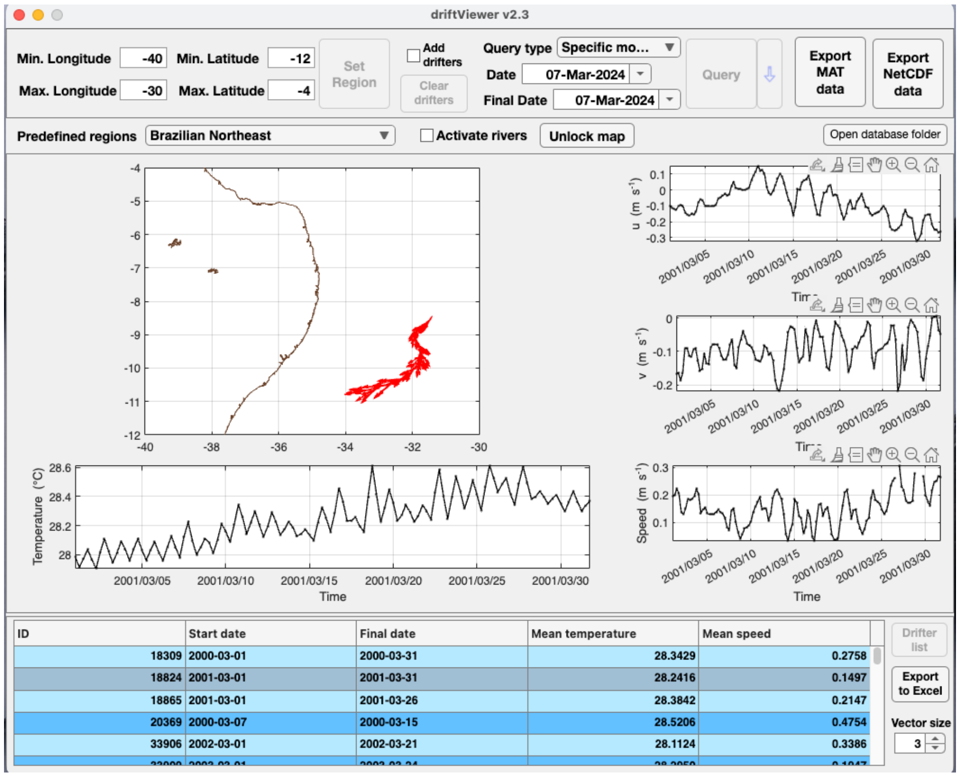
Drifter list

300234064806180
300234066431260
300234067278360
300234062328350
9832424
9820353
9820348
9817289

ID	Start date	Final date	Mean temperature	Mean speed
3136482	2012-03-01	2012-03-16	999.9990	0.4033
9619733	1999-03-11	1999-03-27	28.3159	0.4238
9701611	2000-03-01	2000-03-31	28.5067	0.0844
9817289	2000-03-01	2000-03-31	999.9990	0.0895
9820348	2000-03-31	2000-03-31	28.5810	0.2007
9820353	2000-03-01	2000-03-12	28.5513	0.4817

Figure 20. Drifters List.

The list of active drifters can be cleared with the ***Clear Drifters*** button. Any active drifter that remains active will be considered the one of interest and will be colored red. Figure 21 shows an example, starting from Figure 19. When this action is performed, the ***Drifters list*** and ***Clear drifter's*** buttons are disabled again, as well as the ***Add drifters'*** option.



Min. Longitude -40 Min. Latitude -12
Max. Longitude -30 Max. Latitude -4
Query type Specific mo...
Date 07-Mar-2024
Final Date 07-Mar-2024
Predefined regions Brazilian Northeast
Vector size 3

ID	Start date	Final date	Mean temperature	Mean speed
18309	2000-03-01	2000-03-31	28.3429	0.2758
18824	2001-03-01	2001-03-31	28.2416	0.1497
18865	2001-03-01	2001-03-26	28.3842	0.2147
20369	2000-03-07	2000-03-15	28.5206	0.4754
33906	2002-03-01	2002-03-21	28.1124	0.3386

Figure 21. Cleaned drifters list.

3.5 Exporting data

Each figure displayed has a contextual menu that allows you to export the figure as an image or copy it to the clipboard. In addition, the figure corresponding to the drifter's trajectory on the map also has an option in this context menu that allows you to display the vectors or only the trajectory (Figure 22).

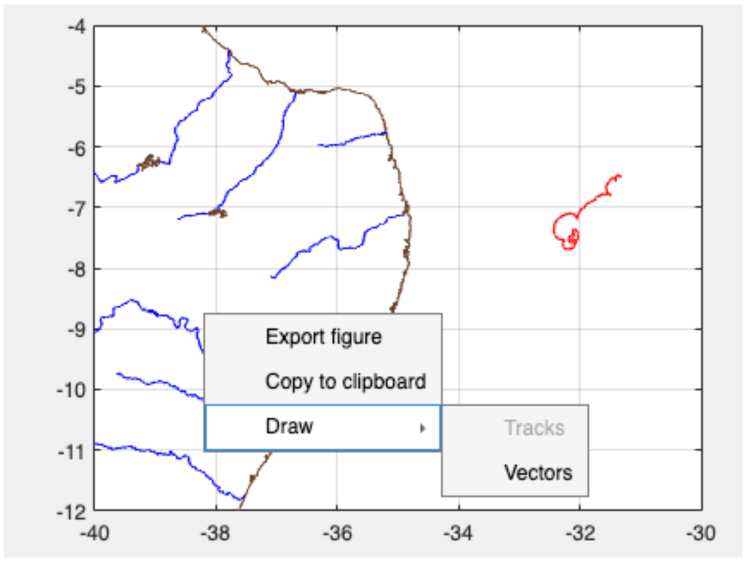
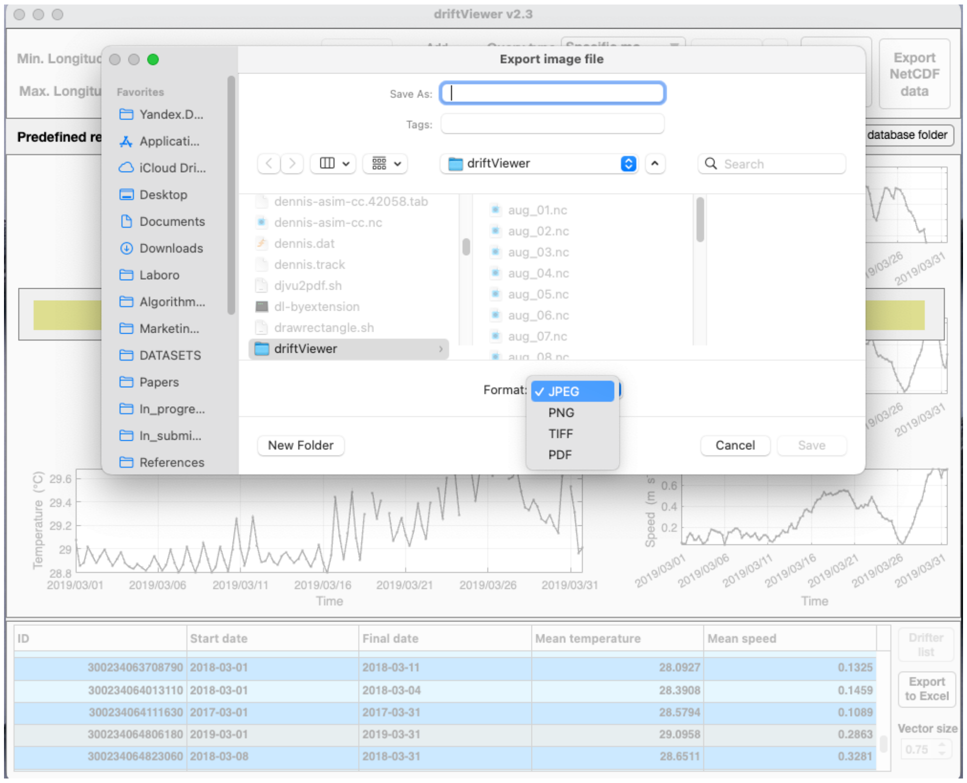


Figure 22. Contextual menu associated with each figure.

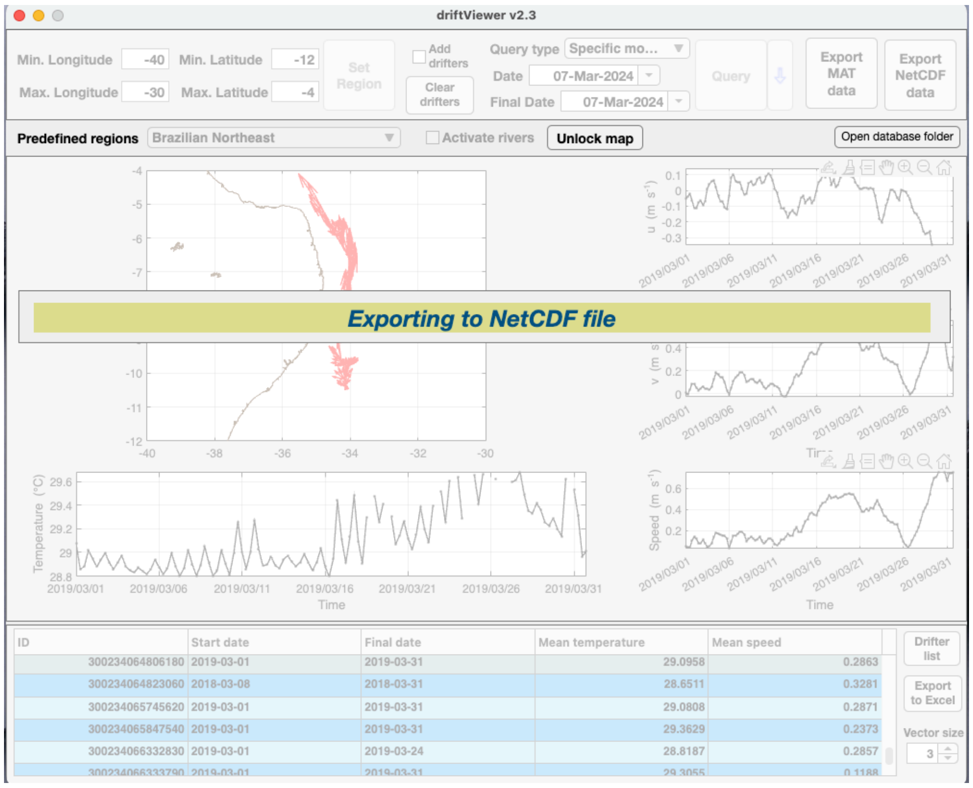
Several formats are allowed for exporting the figure as an image or copying it to the clipboard, as shown in Figure 23.



ID	Start date	Final date	Mean temperature	Mean speed
300234063708790	2018-03-01	2018-03-11	28.0927	0.1325
300234064013110	2018-03-01	2018-03-04	28.3908	0.1459
300234064111630	2017-03-01	2017-03-31	28.5794	0.1089
300234064806180	2019-03-01	2019-03-31	29.0958	0.2863
300234064823060	2018-03-08	2018-03-31	28.6511	0.3281

Figure 23. Export formats for figures as images.

The data corresponding to the selected drifter that is displayed can be exported to MATLAB or NETCDF format. Figure 24 shows the message that the software displays when exporting to NETCDF format. A similar message is displayed when exporting to MATLAB.



Min. Longitude -40 Min. Latitude -12
Max. Longitude -30 Max. Latitude -4
Query type Specific mo...
Date 07-Mar-2024
Final Date 07-Mar-2024
Predefined regions Brazilian Northeast
Activate rivers
Vector size 3

Exporting to NetCDF file

ID	Start date	Final date	Mean temperature	Mean speed
300234064806180	2019-03-01	2019-03-31	29.0958	0.2863
300234064823060	2018-03-08	2018-03-31	28.6511	0.3281
300234065745620	2019-03-01	2019-03-31	29.0808	0.2871
300234065847540	2019-03-01	2019-03-31	29.3629	0.2373
300234066332830	2019-03-01	2019-03-24	28.8187	0.2857
300234066333790	2019-03-01	2019-03-31	29.3055	0.1188

Figure 24. Exporting to NETCDF file.

The created **NETCDF** file has the following structure:

```
netcdf \01 {
dimensions:
        time = UNLIMITED ; // (124 currently)
variables:
        double time(time) ;
                time:standard_name = "time" ;
                time:long_name = "time" ;
                time:calendar = "standard" ;
                time:units = "days since 1900-01-01" ;
        double lon(time) ;
                lon:standard_name = "lon" ;
                lon:long_name = "lon" ;
                lon:units = "degrees_east" ;
        double lat(time) ;
                lat:standard_name = "lat" ;
                lat:long_name = "lat" ;
                lat:units = "degrees_north" ;
        double uc(time) ;
                uc:standard_name = "u" ;
                uc:long_name = "Zonal component" ;
                uc:units = "m s^{-1}" ;
                uc:missing_value = NaN ;
        double vc(time) ;
                vc:standard_name = "v" ;
                vc:long_name = "Meridional component" ;
                vc:units = "m s^{-1}" ;
                vc:missing_value = NaN ;
        double spd(time) ;
                spd:standard_name = "Speed" ;
                spd:long_name = "Surface current speed" ;
                spd:units = "m s^{-1}" ;
                spd:missing_value = NaN ;
        double sst(time) ;
                sst:standard_name = "sst" ;
                sst:long_name = "Sea Surface Temperature" ;
                sst:units = "degree C" ;
                sst:missing_value = NaN ;

// global attributes:
                :creation_date = "23-Sep-2024 12:37:52" ;
                :Producer = "driftViewer v1.0" ;
                :Developers = "Humberto L. Varona" ;
                :LicenseType = "MIT License" ;
                :DataType = "Time series" ;
                :Comment = "driftViewer generated file" ;
                :Organization = "Federal University of Pernambuco" ;
                :Department = "LOFEC/DOCEAN" ;
                :Drifter_ID = "300234064806180" ;
                :Start_date = "01-Mar-2019" ;
                :Final_date = "31-Mar-2019 18:00:00" ;
}
```

The created **MATLAB** file has the following structure:

```
Variable name: DrifterID
  Size: [1 1]
  Class: int64
  Memory (bytes): 8

Variable name: Lats
  Size: [35 1]
  Class: double
  Memory (bytes): 280

Variable name: Lons
  Size: [35 1]
  Class: double
  Memory (bytes): 280

Variable name: SST
  Size: [35 1]
  Class: double
  Memory (bytes): 280

Variable name: Speed
```

```
  Size: [35 1]
  Class: double
  Memory (bytes): 280

Variable name: Time
  Size: [35 1]
  Class: double
  Memory (bytes): 280

Variable name: U
  Size: [35 1]
  Class: double
  Memory (bytes): 280

Variable name: V
  Size: [35 1]
  Class: double
  Memory (bytes): 280
```

<u>In this case, another way to analyze this structure is the following:</u>

MATLAB code

```
function details(s, indentLevel)
    if nargin < 2
        indentLevel = 0;
    end

    indent = repmat(' ', 1, indentLevel);

    if isstruct(s)
        fieldNames = fieldnames(s);

        for i = 1:length(s)
            fprintf('%sStruct #%d\n', indent, i);

            for j = 1:length(fieldNames)
                field = fieldNames{j};
                value = s(i).(field);
                fprintf('%s%s: ', indent, field);
                if isstruct(value)
                    fprintf('\n');
                    details(value, indentLevel + 1);
                else
                    if isnumeric(value)
```

```
                        fprintf('%s\n', mat2str(value));
                    elseif ischar(value)
                        fprintf('%s\n', value);
                    else
                        fprintf('[%s]\n', class(value));
                    end
                end
            end
        end
    end
end
```

```
Struct #1
name: DrifterID
size: [1 1]
bytes: 8
class: int64
global: [logical]
sparse: [logical]
complex: [logical]
nesting:
  Struct #1
  function:
  level: 0
persistent: [logical]
Struct #2
name: Lats
size: [35 1]
bytes: 280
class: double
global: [logical]
sparse: [logical]
complex: [logical]
nesting:
  Struct #1
  function:
  level: 0
persistent: [logical]
```

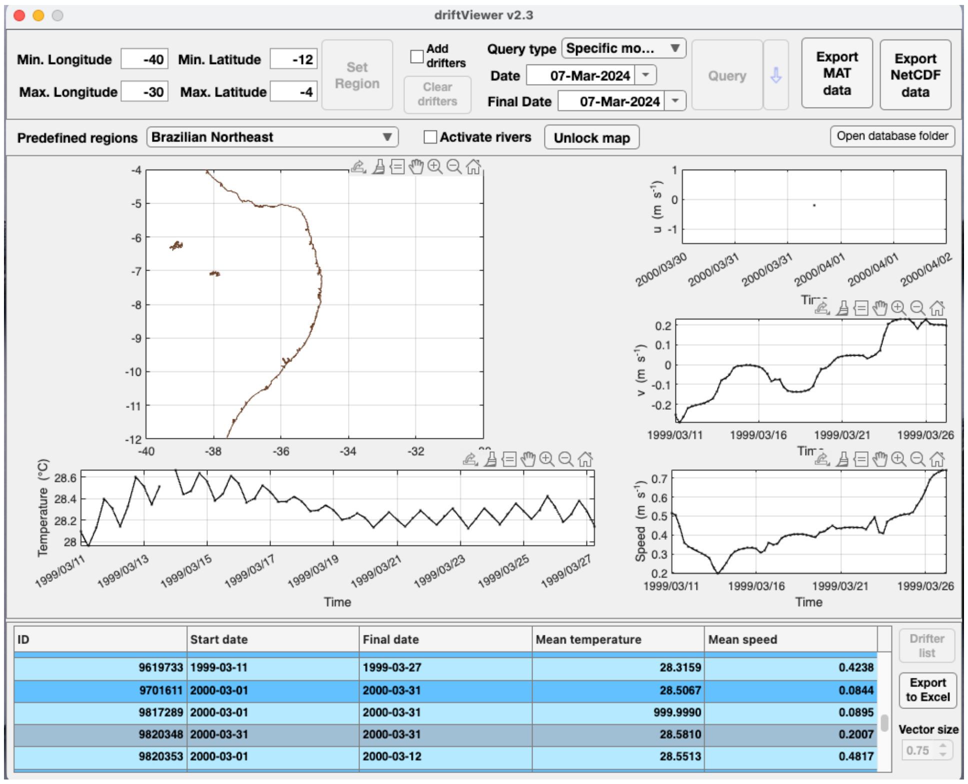
```
Struct #3
name: Lons
size: [35 1]
bytes: 280
class: double
global: [logical]
sparse: [logical]
complex: [logical]
nesting:
    Struct #1
    function:
    level: 0
persistent: [logical]
Struct #4
name: SST
size: [35 1]
bytes: 280
class: double
global: [logical]
sparse: [logical]
complex: [logical]
nesting:
    Struct #1
    function:
    level: 0
persistent: [logical]
Struct #5
name: Speed
size: [35 1]
bytes: 280
class: double
global: [logical]
sparse: [logical]
complex: [logical]
```

```
nesting:
   Struct #1
   function:
   level: 0
persistent: [logical]
Struct #6
name: Time
size: [35 1]
bytes: 280
class: double
global: [logical]
sparse: [logical]
complex: [logical]
nesting:
   Struct #1
   function:
   level: 0
persistent: [logical]
Struct #7
name: U
size: [35 1]
bytes: 280
class: double
global: [logical]
sparse: [logical]
complex: [logical]
nesting:
   Struct #1
   function:
   level: 0
persistent: [logical]
Struct #8
name: V
size: [35 1]
```

```
bytes: 280
class: double
global: [logical]
sparse: [logical]
complex: [logical]
nesting:
   Struct #1
   function:
   level: 0
persistent: [logical]
```

4 Troubleshoot

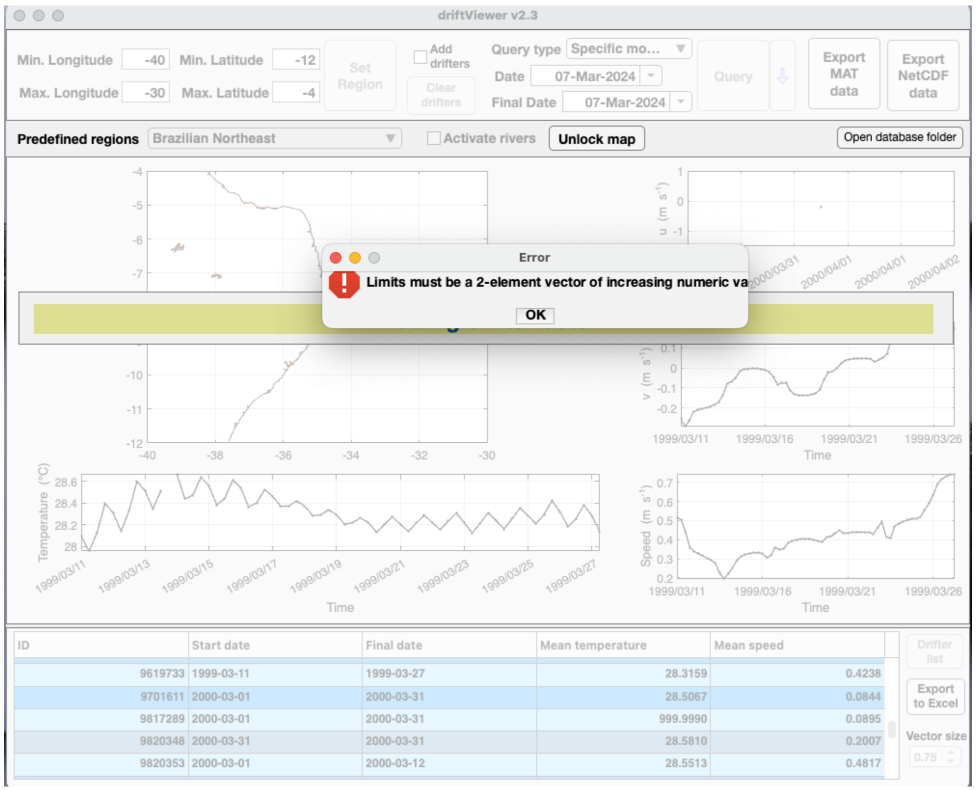
It may happen that the data associated with a drifter does not have values for all the variables being measured. In this case, the software will display an error message. For example, figures 25 and 26 show the data associated with drifter 9820348, where the values for the zonal component of the wind variable are missing. This may happen in cases where the drifter stopped transmitting values for some reason.



Min. Longitude -40 Min. Latitude -12
Max. Longitude -30 Max. Latitude -4
Date 07-Mar-2024
Final Date 07-Mar-2024

ID	Start date	Final date	Mean temperature	Mean speed
9619733	1999-03-11	1999-03-27	28.3159	0.4238
9701611	2000-03-01	2000-03-31	28.5067	0.0844
9817289	2000-03-01	2000-03-31	999.9990	0.0895
9820348	2000-03-31	2000-03-31	28.5810	0.2007
9820353	2000-03-01	2000-03-12	28.5513	0.4817

Figure 25. Data associated with drifter 9820348, where the zonal component of the surface marine current is missing.



Error

Limits must be a 2-element vector of increasing numeric va

OK

ID	Start date	Final date	Mean temperature	Mean speed
9619733	1999-03-11	1999-03-27	28.3159	0.4238
9701611	2000-03-01	2000-03-31	28.5067	0.0844
9817289	2000-03-01	2000-03-31	999.9990	0.0895
9820348	2000-03-31	2000-03-31	28.5810	0.2007
9820353	2000-03-01	2000-03-12	28.5513	0.4817

Figure 26. Error reported by the software when there are no values available in a variable.

5 References

[1] Wessel, P., and W. H. F. Smith (1996), A global, self-consistent, hierarchical, high-resolution shoreline database, J. Geophys. Res., 101(B4), 8741–8743, doi:10.1029/96JB00104

[2] Laurindo, L. C., Mariano, A. J., and Lumpkin, R. (2017). An improved near-surface velocity climatology for the global ocean from drifter observations. In Deep Sea Research Part I: Oceanographic Research Papers (Vol. 124, pp. 73–92). Elsevier BV, doi: 10.1016/j.dsr.2017.04.009