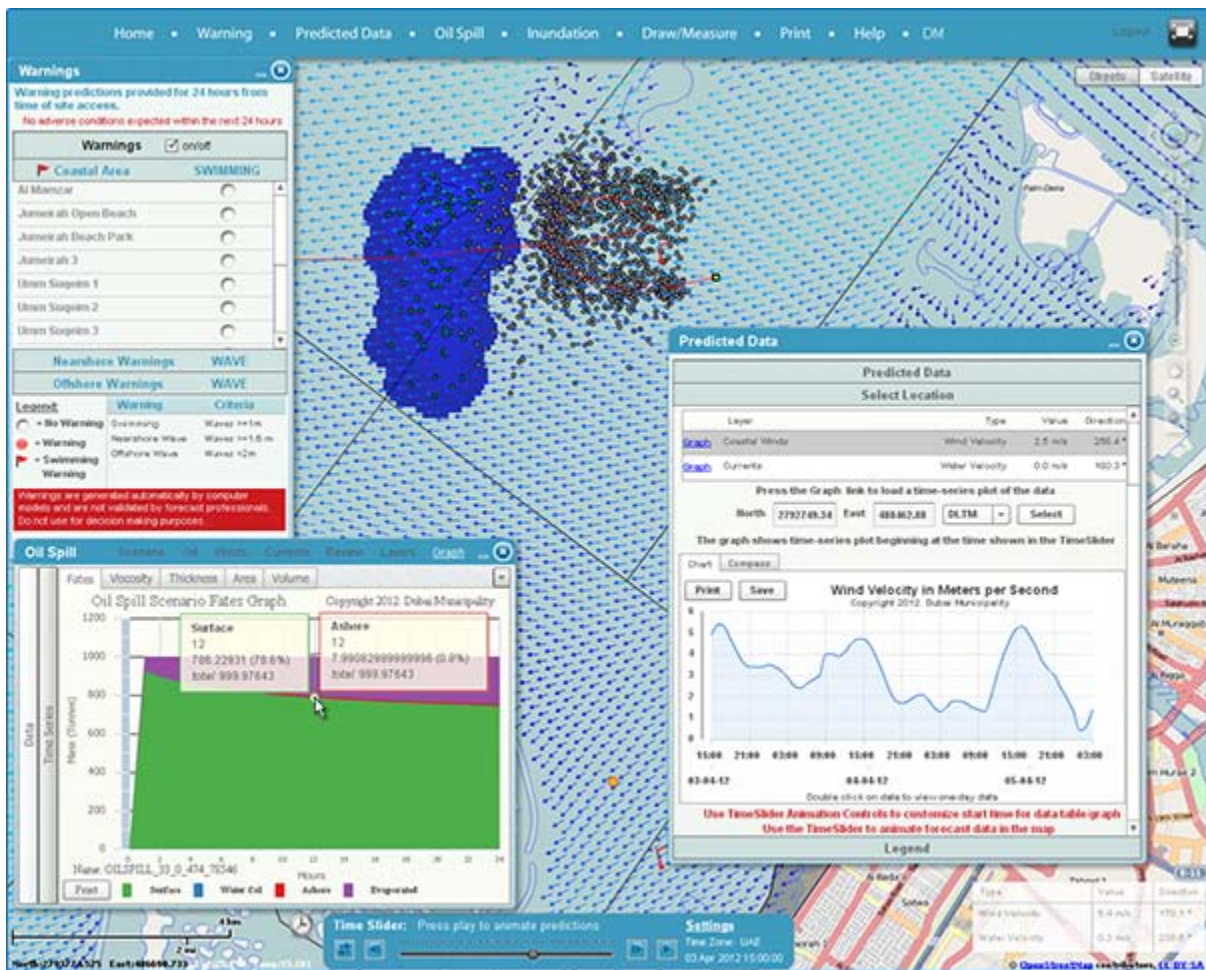


# Dubai Coastal Zone Monitoring Programme Forecasting Website

## User's Manual

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## **About the Dubai Coastal Zone Monitoring Programme Forecasting Website**

The Dubai Coastal Zone Monitoring Programme forecasting website is launched as part of the new operational forecasting system being operated and maintained by Dubai Municipality. This forecasting system, under development for the past year, is a suite of coupled meteorological and ocean models and is a landmark effort by DM to provide accurate and detailed information on metocean forecasts and extreme conditions along the entire Dubai coastline.

We hope that the user will find the site to be an informative source of wind (speed and direction), wave (height and direction), and current (speed and direction) forecasts. The site also provides hazardous weather statements when the forecasts predict extreme conditions. These statements are generated automatically by computer models and are not validated by forecast professionals. They are not intended for decision-making purposes.

## Getting Started

It is strongly recommended that the user works through the Dubai Coastal Zone Monitoring Programme Forecasting Website user's manual to best understand the application's capabilities.

**Visit:** <http://www.dubaicoast.ae/en-GB/sites/forecasting/index>

*Note:* This URL may change in the future.

## User Levels

*Listed below are the different user levels and the privileges associated with each.*

### **Unregistered Guest**

- Warnings
- Forecast Layers with Time Slider (Time Slider settings unavailable)
- No previous forecast
- No Oil Spill
- No Inundations
- No wave height model/data comparisons
- No warning email notifications

### **Registered Guest**

- Warnings
- Forecast Layers with Time Slider (Time Slider settings unavailable)
- No previous forecast
- No Oil Spill
- No Inundations
- No wave height model/data comparisons
- Warning email notification if desired

### **Emergency (e.g. Police etc)**

- Warnings
- Forecast Layers with Time Slider (Time Slider settings available)
- Oil Spill
- Inundations
- No warning email notifications

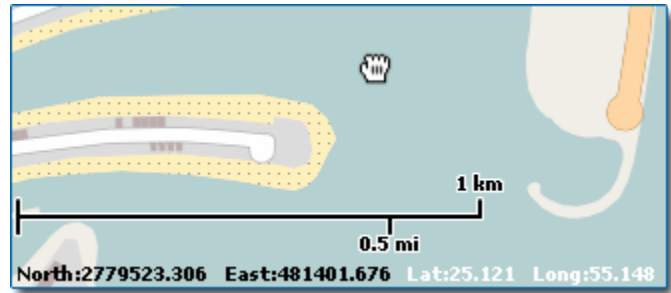
### **DM**

- Warnings
- Forecast Layers with Time Slider (with Time Slider settings available)
- Previous forecast
- Oil Spill
- Inundations
- Wave height model/data comparisons
- Option to show OFS shoreline layer

## 1 MAP NAVIGATION

Mouse-based map navigation can happen in one of three ways.

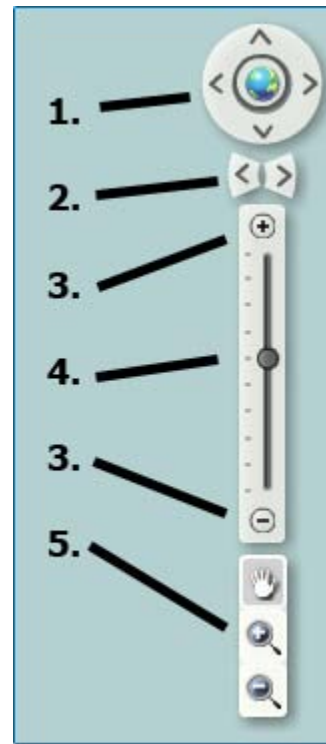
1. Grab and Pan – position the mouse, click and hold the left mouse button and drag the map.



*Figure 1-1 User navigating map with grab and pan*

2. Using the Navigation Control –

1. Click an arrow to pan in that direction. Click the globe icon to return to the full extent of the forecasting area.
2. Click the left and right arrows to toggle between previous extents viewed.
3. Click + to zoom in on the center of the map. Click – to zoom out.
4. Drag the zoom slider up or down to zoom in or out incrementally.
5. With the pan option selected (hand icon), use the mouse to grab and pan. With the zoom in or zoom out option selected, click and drag an area with the mouse to zoom in or out of.



*Figure 1-2 Navigation Control*

3. Mouse Scroll Wheel – with the mouse positioned over the map, rotate the scroll wheel forward to zoom in and backward to zoom out.

## 2 DISPLAY OPTIONS

### Full Screen Mode

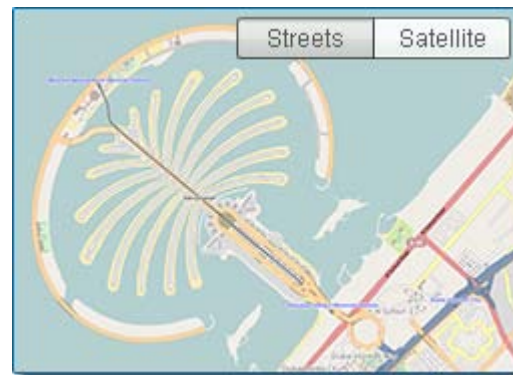
Click the Full Screen icon (Figure 2-1) to enter into Full Screen mode. To exit Full Screen mode, click the icon again or press the **Esc** key on the keyboard.



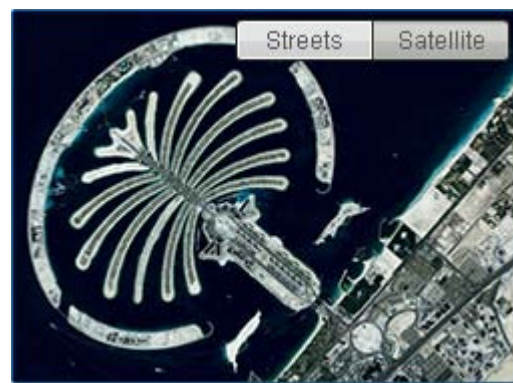
*Figure 2-1 Full Screen icon*

### Changing the Basemap Layer

To change the basemap layer between street and satellite view, click the designated button.



*Figure 2-2 Streets basemap layer enabled*



*Figure 2-3 Satellite basemap layer enabled*

### 3 TIME SLIDER

Located at the bottom of the screen is the Time Slider (Figure 3-1). This tool is used in conjunction with the **Predicted Data** and **Oil Spill** widgets to view forecasted conditions up to 72 hours. Click the play button to watch the forecast, or step through frame by frame using the step buttons. The user can also click and drag the slider itself to move forwards and backwards through the forecasted time period.

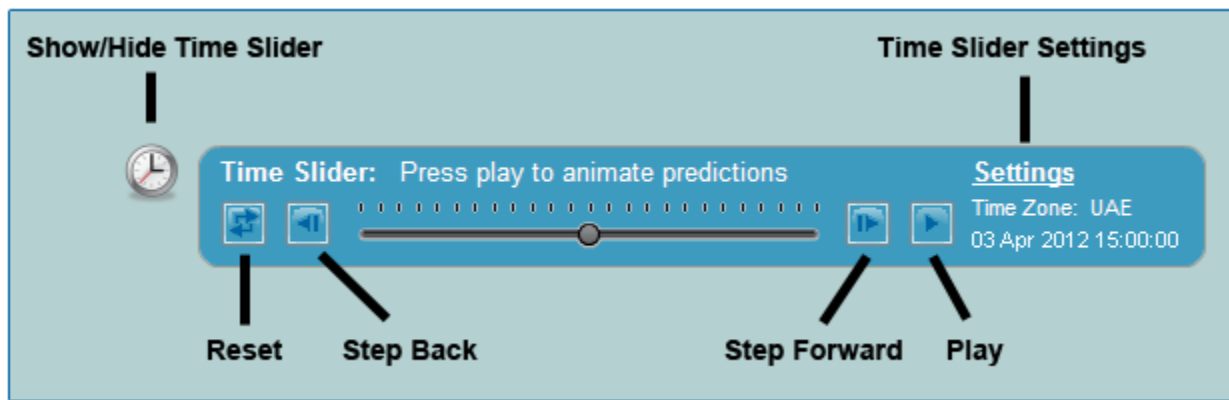


Figure 3-1 Time Slider tool

Figure 3-2 shows the dialog box that appears after clicking the Settings link.

*Note: This feature is only available to **Emergency** and **DM** users.*

Here, users are able to determine the **Start** and **End Time**, and choose the **Time Interval** and **Display Rate**.

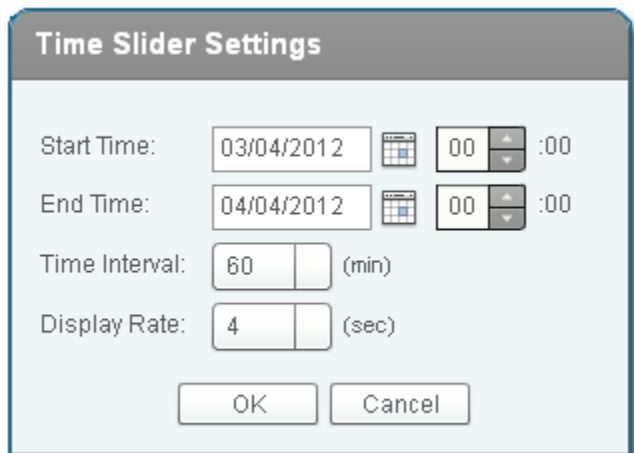


Figure 3-2 Time Slider settings

## 4 WARNINGS

The Warnings widget is automatically displayed the first time the website is accessed and can be closed by clicking the **x** in the top right corner or by clicking the corresponding button in the toolbar.

This tool lists warnings for three areas: **Coastal Area**, **Nearshore**, and **Offshore**. Any wave or swim warnings that are currently in effect for the specified zones will be displayed here.

Warning areas (displayed in red on map) can be toggled on and off by clicking the corresponding check box.

For more information about a specific warning area, click on the listing or within the area on the map.



**Figure 4-1** Warning panel

Figure 4-1 displays the warning panel that is shown on the map. Toggle between the different time periods to view any warnings that are in effect for the specified time.

Warning	Criteria
Swimming	Waves $\geq 1$ m
Nearshore Wave	Waves $\geq 1.6$ m
Offshore Wave	Waves $> 2$ m

**Figure 4-2** Warnings widget

Click the link at the bottom of the widget to register for email alerts. An email alert will be sent to the user if a warning is in effect for the specified area.

Toggle between **Coastal Area**, **Nearshore**, and **Offshore** warnings by clicking on the corresponding tab. The tab will then slide up, revealing the list of areas. Figure 4-3 displays the Warnings widget after the **Near Shore** tab was clicked on.



*Figure 4-3 List of Nearshore areas*

Figure 4-4 displays the warning that is shown when the user clicks on the listing in the Warnings widget or in that area on the map.

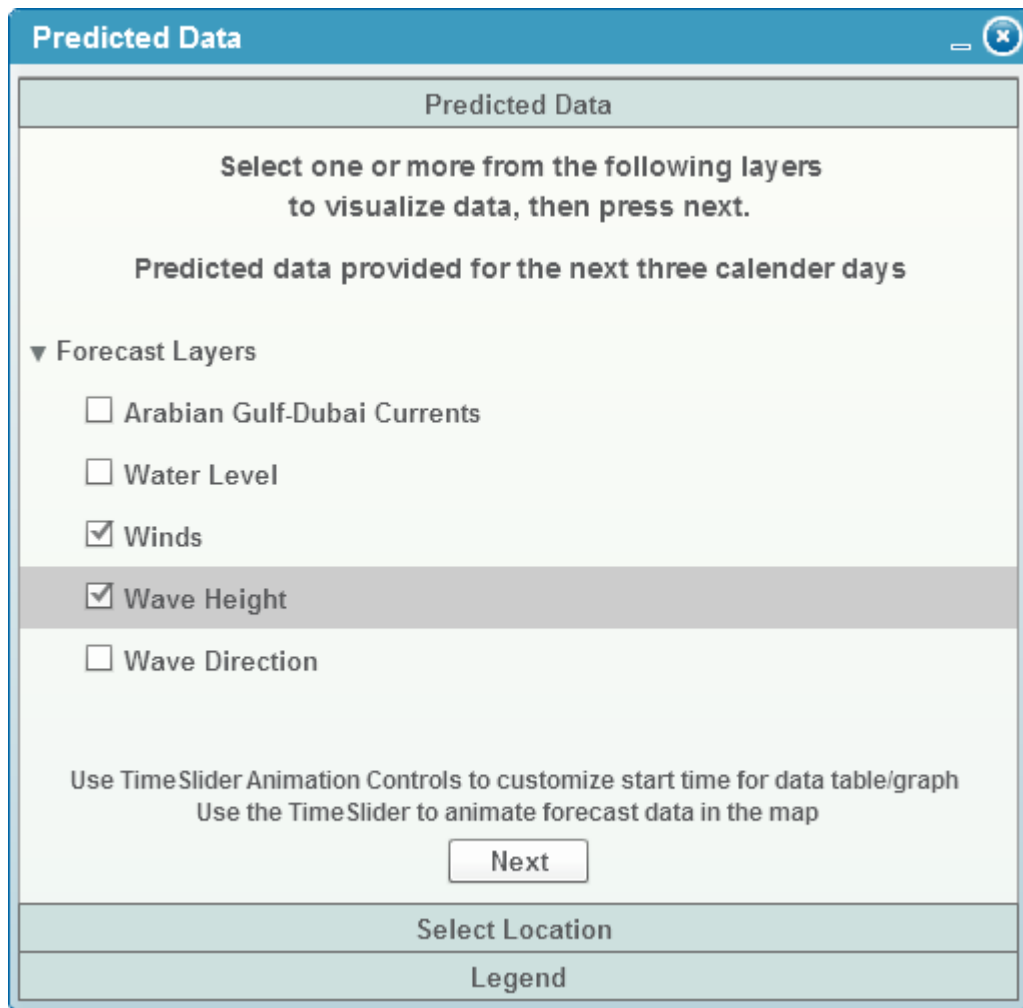


*Figure 4-4 Nearshore Warning panel*

## 5 PREDICTED DATA

The Predicted Data widget allows users to view current and forecasted metrological conditions. After selecting which layers to display, users can use the Time Slider tool to view forecasted conditions from up to 72 hours.

### 5.1 Forecast Layers



*Figure 5-1 Opening screen for Predicted Data widget*

Figure 5-1 shows the opening screen of the Predicted Data widget. Choose at least one forecast layer to be displayed and then click the **next** button.



Figure 5-2 Map with winds and wave height layers enabled (barbs point in the direction the wind is coming from)

## 5.2 Select Location

After forecast layers are chosen, the user is given the option to select a single location on the map or an entire warning area. Click on either radio button, and then on the map, to view the data at that point or area. Clear your selection by clicking on the **Clear Selection** button.

Click the **Graph** link to see a graph of the data. **Print** or **Save** the graph to a PDF file. Hover over the graph with the mouse to view data in detail.

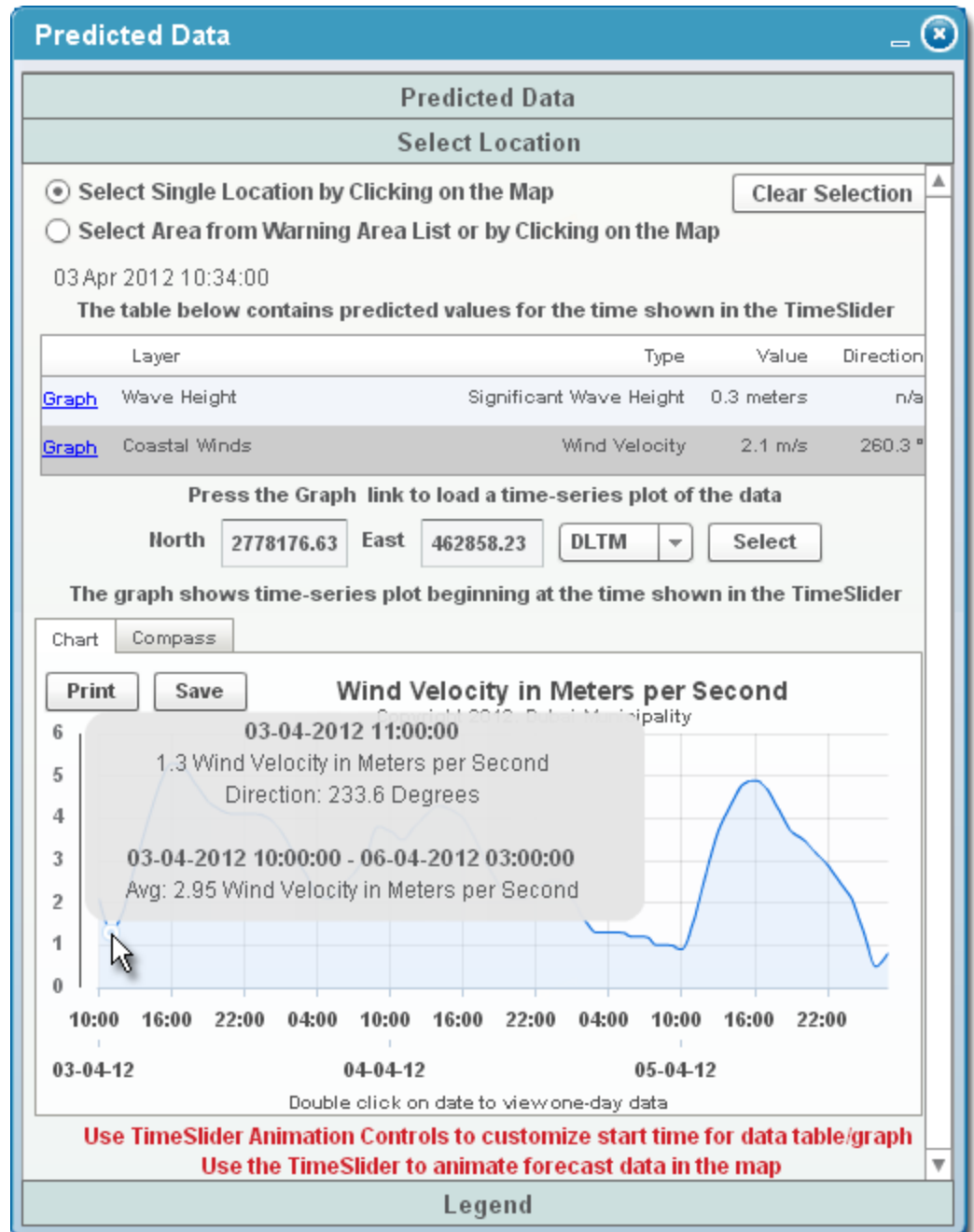


Figure 5-3 Predicted Data widget with graph

If the data has a directional component, click the **Compass** tab to view a three day forecast. Click and drag the Time Slider or click the play icon to view the forecasted data.

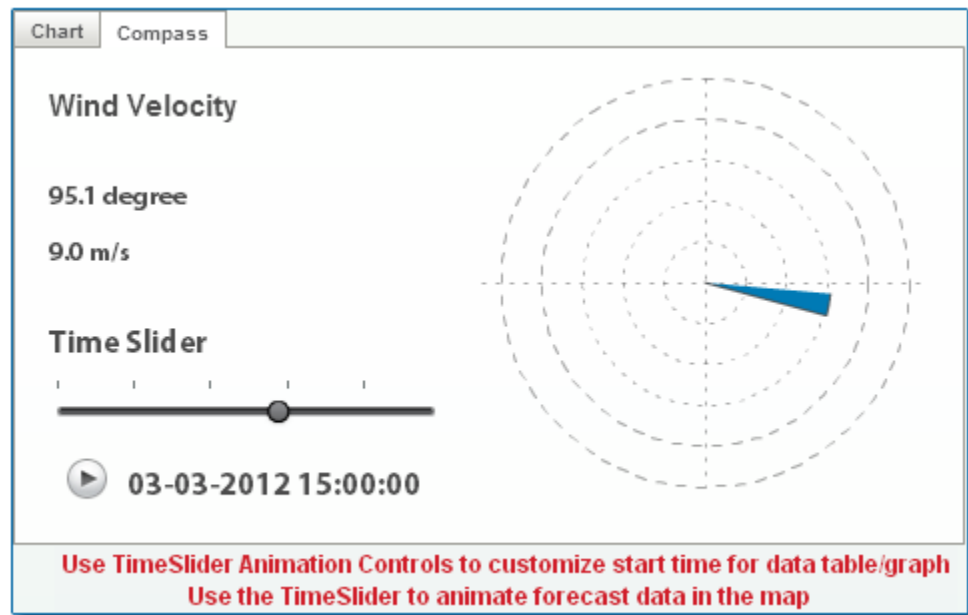


Figure 5-4 Predicted Data widget with compass

### 5.3 Legend

For reference, click the **Legend** button to view a list of the values associated with the symbols on the map. Wind barbs point in the direction the wind is coming from.

Depending on which forecast layers the user has enabled, only those legends will show. In Figure 5-5, the user has Arabian Gulf-Dubai Currents, Water Level, Winds, and Wave Heights enabled.

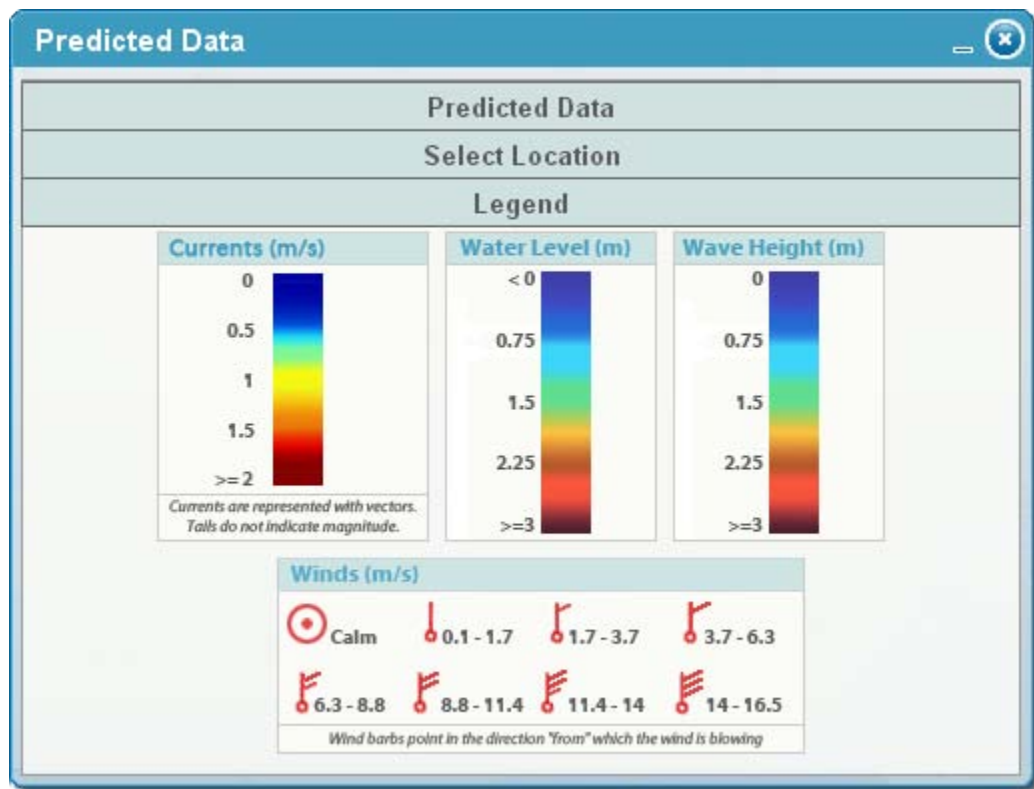
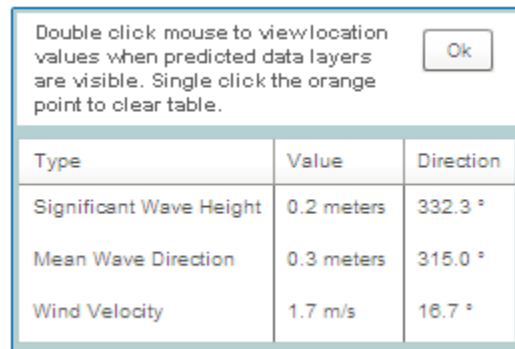


Figure 5-5 Predicted Data Legend

## 5.4 Quick Data Viewer

Figure 5-6 displays the Quick Data Viewer located in the bottom right-hand corner of the map. With at least one predicted data layer enabled, users are able to double-click on an area on the map and view the resulting data.



Double click mouse to view location values when predicted data layers are visible. Single click the orange point to clear table.

Type	Value	Direction
Significant Wave Height	0.2 meters	332.3 °
Mean Wave Direction	0.3 meters	315.0 °
Wind Velocity	1.7 m/s	18.7 °

**Figure 5-6 Quick Data Viewer**

## 6 OIL SPILL

The Oil Spill widget lets users load or create a new spill scenario. Users can choose where a spill occurs, the type of oil and the amount spilled, the length of the simulation, and also which environmental factors, if any, should be included. After the scenario is determined, users can play or step through the simulation visualization on the map as well as a time series graph of the processed data.

*Note:* The oil spill tool is unavailable to registered and unregistered guest users.

### 6.1 Scenario

Figure 6-1 displays the oil spill scenario panel set to create a new scenario. Each scenario created is stored allowing users to load previous scenarios, as well as delete them.

**Figure 6-1 Oil Spill widget Scenario panel**

To create a new scenario, begin by choosing a name and description (unnamed scenarios will be given a default name). Next, click the **Spill Site** button to choose the location of the spill by clicking on a point on the map or manually enter in coordinates. There are three formats to choose from when manually entering in coordinates: **DD.DD** (decimal degrees, example: *Latitude: 25.352°N Longitude: 54.969°E*), **DD MM.MM** (degrees decimal minutes, *Latitude: 25° 24.881'N Longitude: 54° 52.846'E*), and **DLTM** (Dubai Local Transverse Mercator, *Northing: 2810548.583m Easting: 457088.136m*). Finally, select the time and date, as well as the water temperature and click **Next**.

## 6.2 Oil

Select the oil spill amount, the type oil being spilled, the simulation length, release duration, model time step, output time interval and continue by clicking **Next**.

The screenshot shows the 'Oil Spill' widget's 'Oil' panel. At the top, there are tabs for 'Scenario', 'Oil', 'Winds', 'Currents', 'Review', 'Layers', and 'Graph'. The 'Oil' tab is selected. The panel contains the following controls:

- Oil Spill Amount:** A text input field with '1000' and a dropdown menu set to 'Tonnes'.
- Oil Type:** A list box with the following items: Dubai Oil - DP Assay, Dubai Crude (highlighted), HFO 380, Lower Zakum, Bunker C Fuel Oil #6, and Gasoline (leaded).
- Simulation Length:** A spinner box set to '24' with '(hours)' next to it.
- Release Duration:** A spinner box set to '0' with '(hours)' next to it.
- Model Time Step:** A dropdown menu set to '20' with '(min)' next to it.
- Output Time Interval:** A dropdown menu set to '60' with '(min) not less than the model time step.' next to it.

At the bottom of the panel are two buttons: 'Previous' and 'Next'.

Figure 6-2 Oil Spill widget Oil panel

## 6.3 Winds

Choose a winds data source. **Forecast Data** and **Dubai WRF winds** are selected by default.

Users can also choose to have no wind data source, or, to manually enter in their own wind data. Continue by clicking **Next**.

The screenshot shows the 'Oil Spill' widget's 'Winds' panel. At the top, there are tabs for 'Scenario', 'Oil', 'Winds', 'Currents', 'Review', 'Layers', and 'Graph'. The 'Winds' tab is selected. The panel contains the following controls and information:

- Winds Data Source:** A dropdown menu set to 'Forecast Data'. A secondary dropdown menu is open, showing 'Forecast Data' (with a mouse cursor), 'MANUAL', and 'NONE'.
- Selected Winds:** A list box containing 'Dubai WRF winds'.
- Selected Winds = DUBAIWND\_winds**
- Name:** Dubai WRF winds
- ID:** DUBAIWND\_winds
- Bounding Box:** 50.8970.23.5500.58.4956.27.7740
- Availability:** 2011/03/01 - 2011/12/18

At the bottom of the panel are two buttons: 'Previous' and 'Next'.

Figure 6-3 Oil Spill widget Winds panel

## 6.4 Currents

Choose a currents data source.

**Forecast Data** and **Arabian Gulf Currents** are selected by default.

Users can also choose to have no currents data source, or, to manually enter in their own currents data. Continue by clicking **Next**.

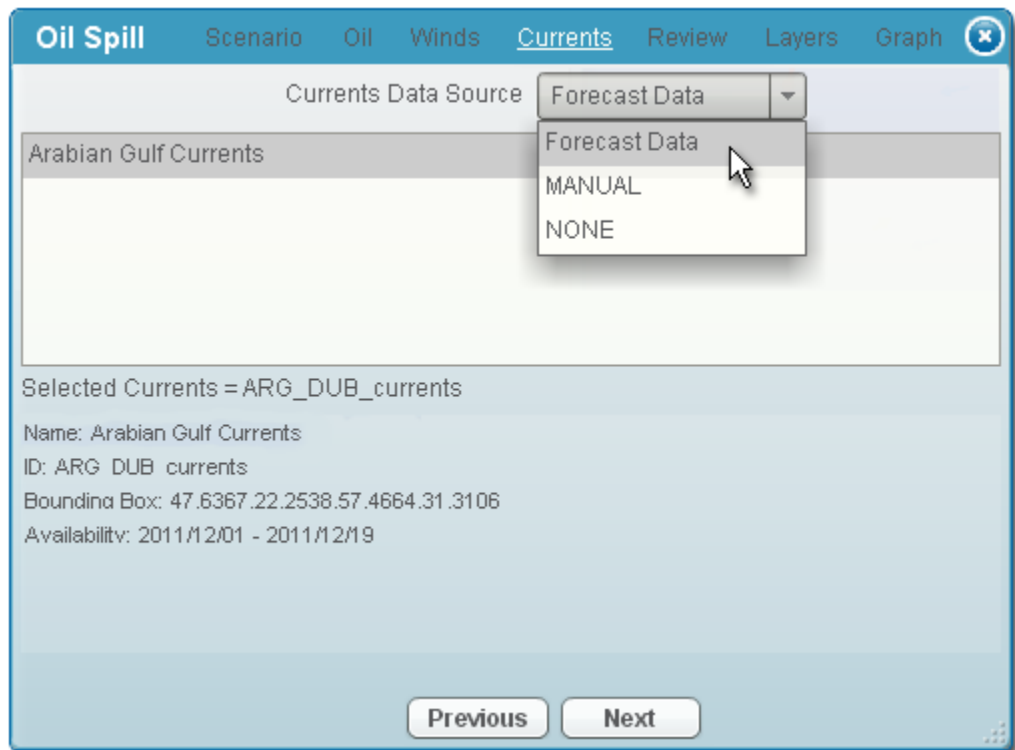


Figure 6-4 Oil Spill widget Currents panel

## 6.5 Review

Review the scenario parameters. Click **Previous** to go back and make changes or click **Run!** to run the simulation.



Figure 6-5 Oil Spill widget Review panel

## 6.6 Layers

The Layers panel includes a legend, as well as the option for users to choose which layers are visible.

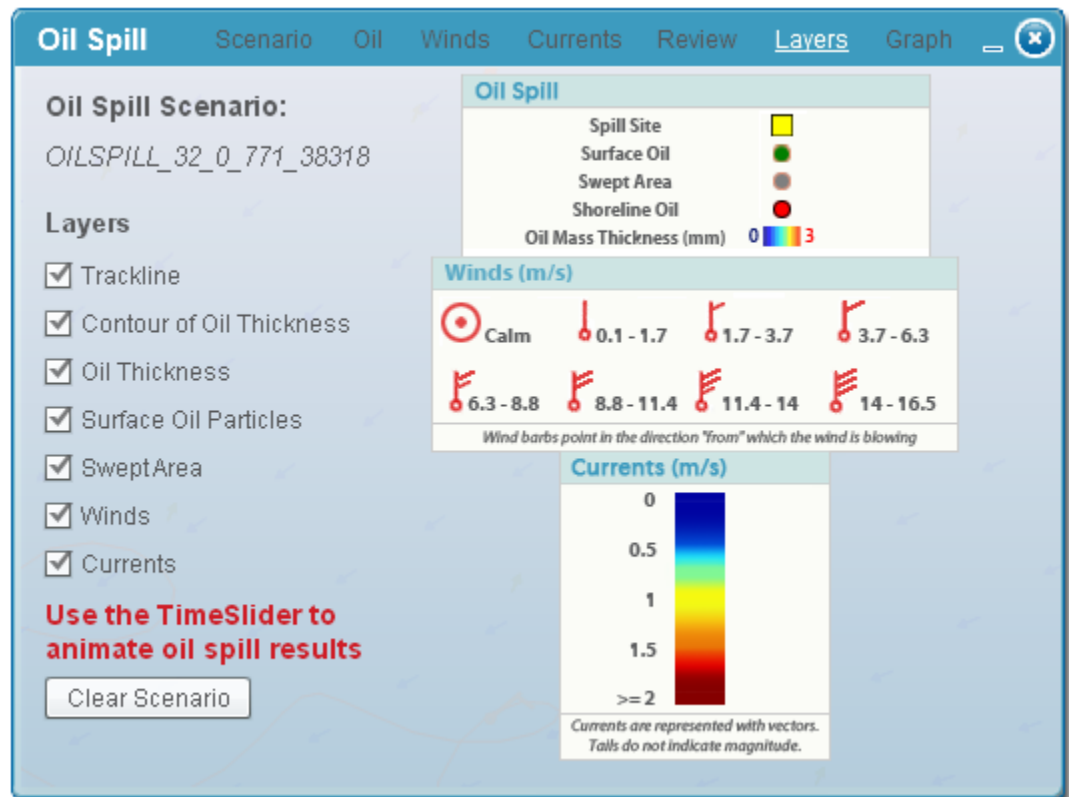


Figure 6-6 Oil Spill widget Layers panel

Displayed in Figure 7-7, the user has all layers enabled except Winds and Currents.

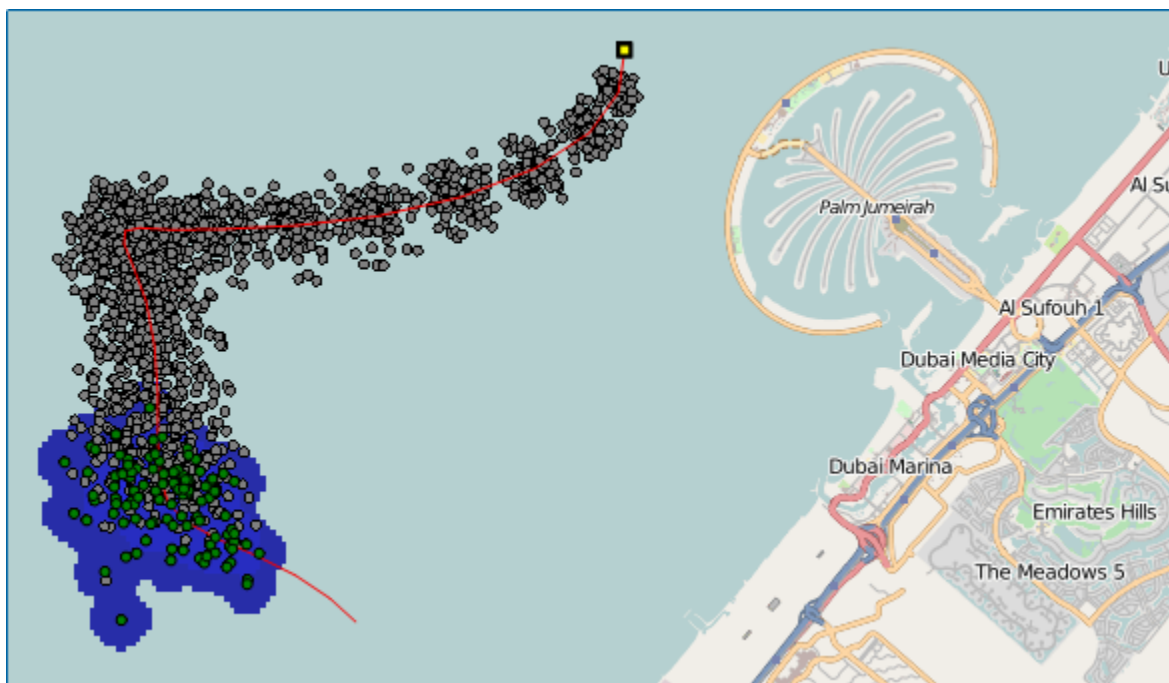


Figure 6-7 Oil Spill screenshot

### 6.7 Graph

The following graphs are generated from the scenario: **Fates, Viscosity, Thickness, Density, Area, and Volume.** Toggle between them by selecting the corresponding tab. With the mouse, hover over the graph to view detailed data.

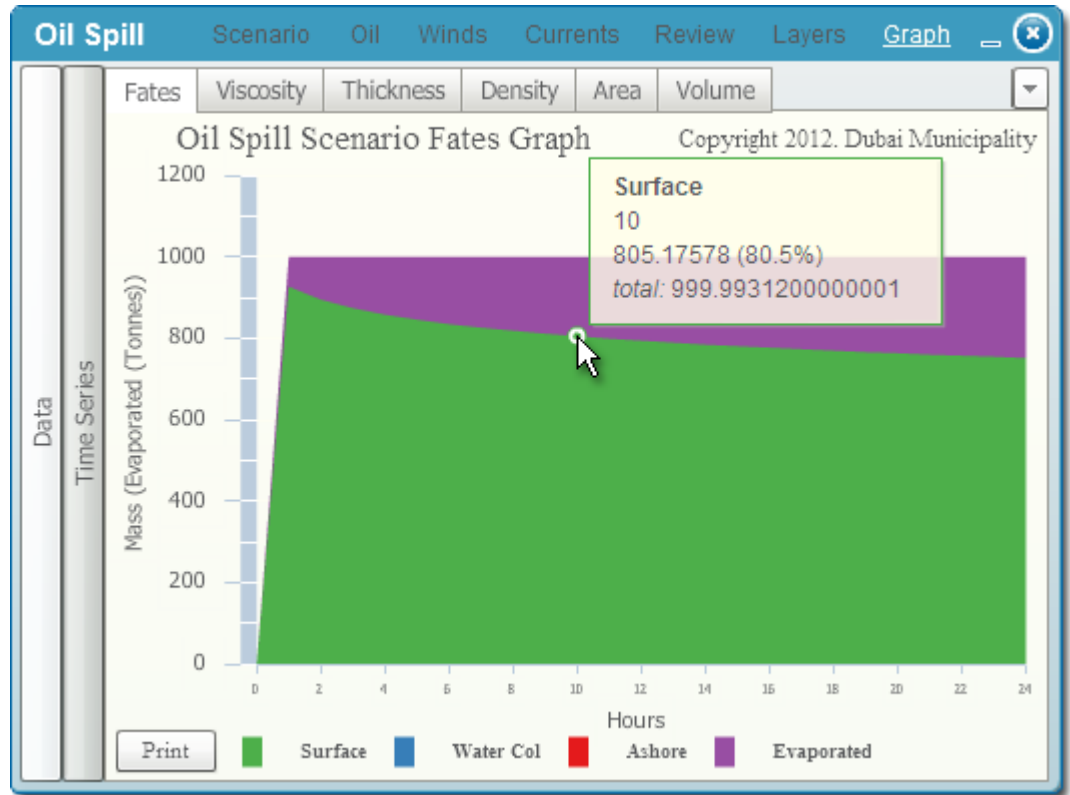


Figure 6-8 Oil Spill widget Graph panel

In addition to the graphs, the weathering values can also be viewed in a table, or downloaded in CSV form. Click on the **Data** bar on the far left to display.

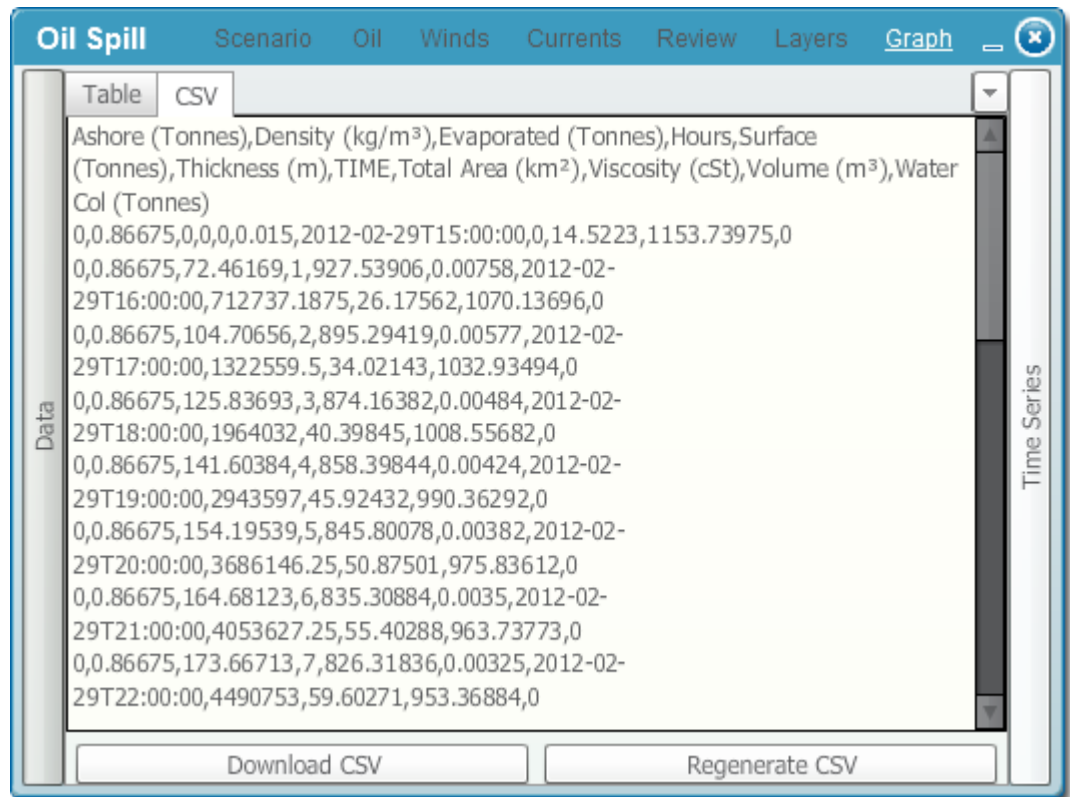


Figure 6-9 Oil Spill widget Graph panel in CSV format

## 6.8 Using the Time Slider

Use the Time Slider to play the simulation visualization or to step through, frame by frame. The user can also click and drag the slider itself to move forwards and backwards through the simulation.

### 24 Hour Simulation Example (Winds forecast layer enabled)

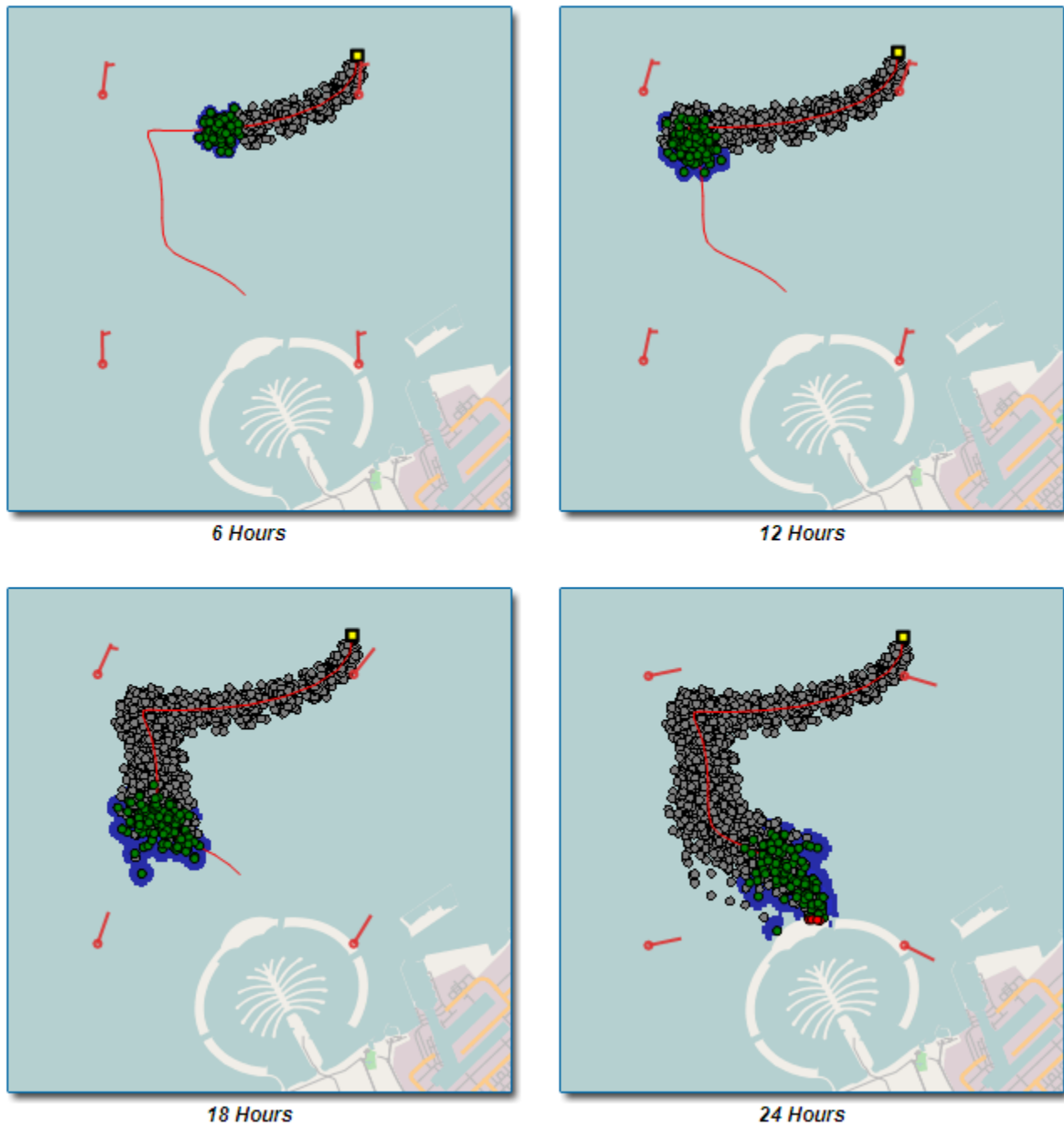


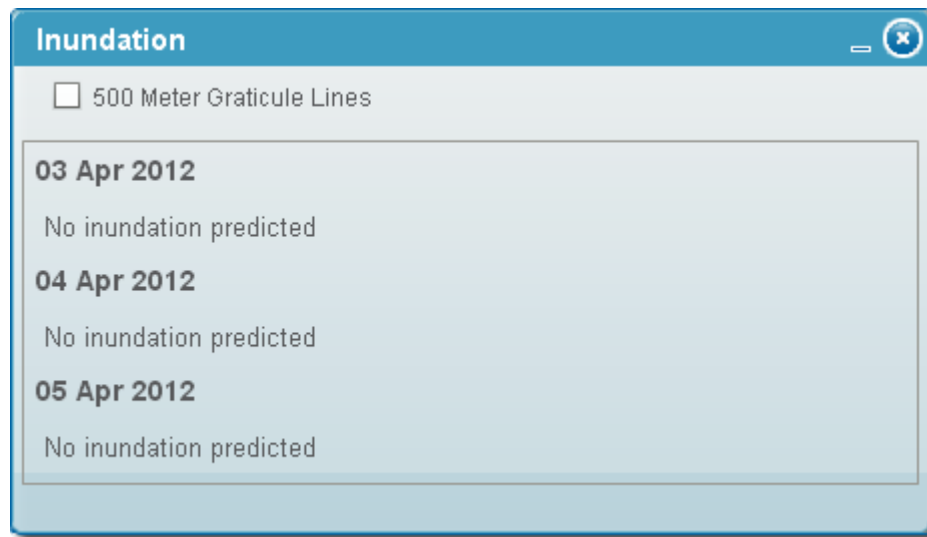
Figure 6-10 Oil Spill Simulation

## 7 INUNDATION

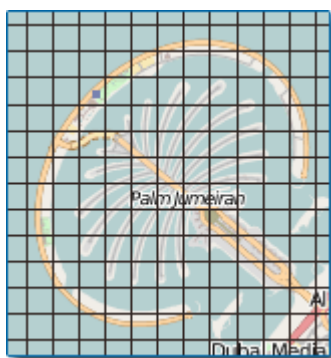
The Inundation tool allows users to view the impacts of three different types of storm intensities, but only when a warning is in effect. By clicking the corresponding check boxes, users can toggle on or off layers displaying the result in sea level rise.

The widget lists the inundation layer most like the conditions predicted by the forecast. The *Current Scenario* entry at the bottom of the widget shows, which, if any, inundation scenario is most like current conditions.

*Note:* The Inundation tool is unavailable to registered and unregistered guest users.



**Figure 7-1 Inundation widget**



**Figure 7-3 Screenshot with Graticule Lines enabled**



**Figure 7-2 Screenshot with 1 Year Storm inundation layer enabled**

## 8 DRAW/MEASURE

The Draw/Measure tool is used to draw and measure lengths and areas on the map. Drawing tools include: **Point**, **Line**, **Freehand Line**, **Rectangle**, **Circle**, **Ellipse**, **Polygon**, **Freehand Polygon**, and **Add Text**.

There is the option to change color and text size, as well as the units of distance and area. Add text to the map by entering in the text into textbox, choosing a color and size, clicking on the **Add Text** icon and then clicking on the map where the text should appear. Not text can only be added by the **Add Text** tool.

Show measurements by clicking the checkbox before drawing a line or polygon.

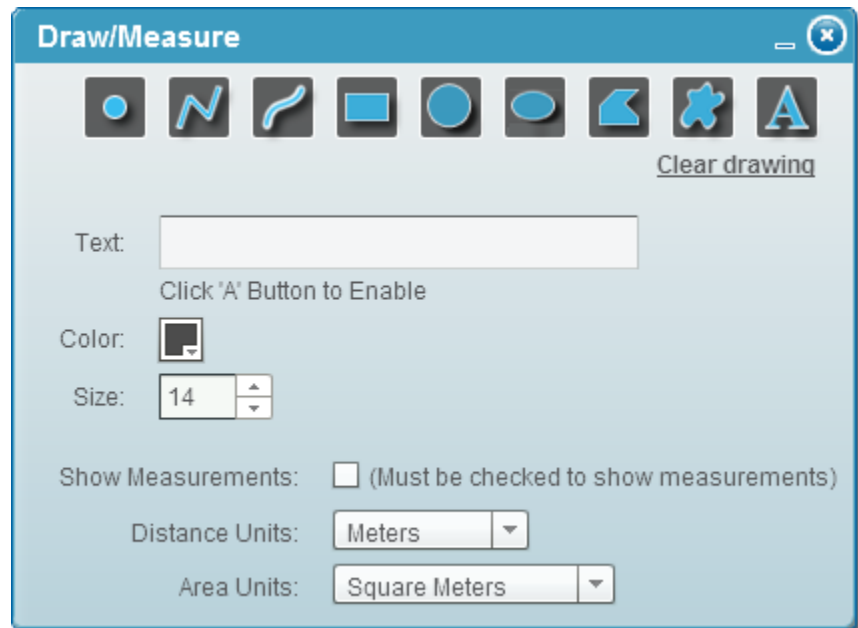
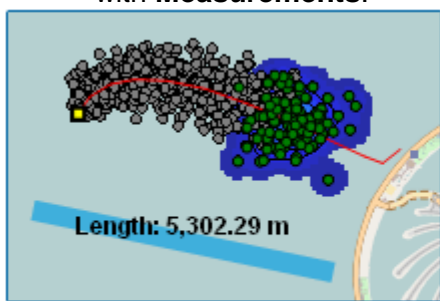
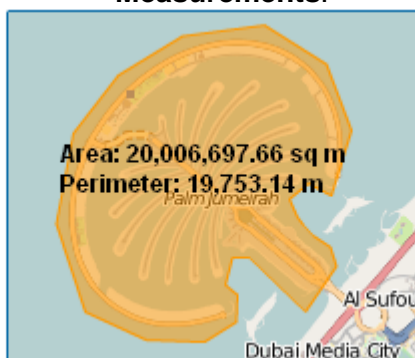


Figure 8-1 Draw/Measure widget

Using the **Line** tool with **Measurements**.



Using the **Polygon** tool with **Measurements**.



Using the **Freehand Polygon** and **Text** tool.

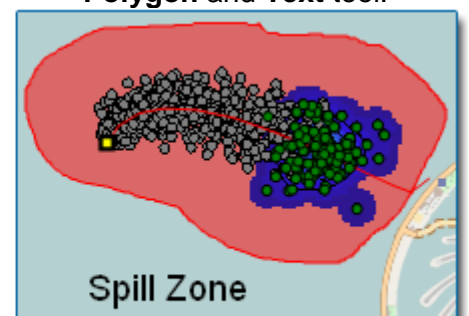
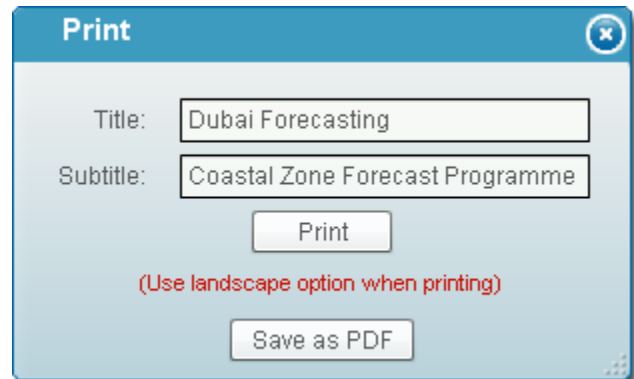


Figure 8-2 Draw/Measure examples

## 9 PRINT

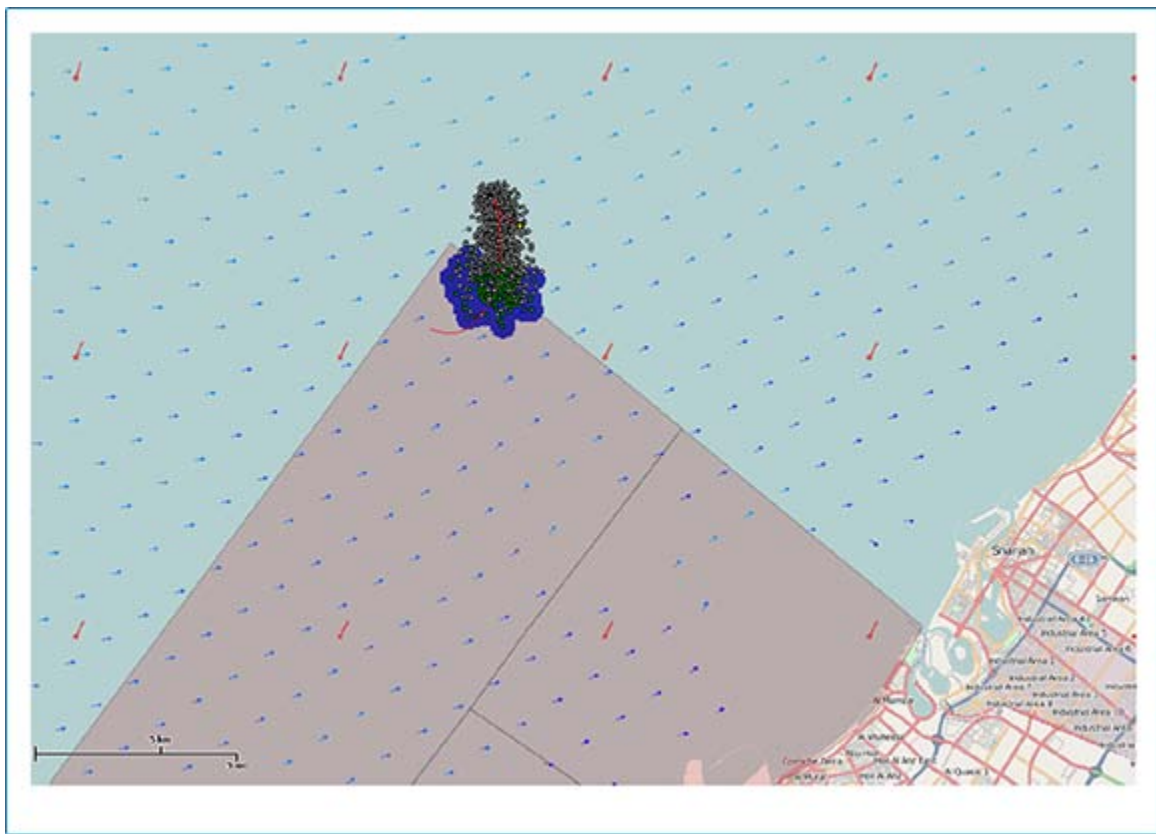
Click the Print button in the menu bar to display the Print panel. Select a title and/or subtitle and either print the current screen or save it as a PDF.

*Note:* Panels, toolbar, and Time Slider are not visible in print out / PDF.



The screenshot shows a 'Print' dialog box with a blue header and a close button in the top right corner. It contains two text input fields: 'Title' with the text 'Dubai Forecasting' and 'Subtitle' with the text 'Coastal Zone Forecast Programme'. Below these fields are two buttons: 'Print' and 'Save as PDF'. A red text instruction '(Use landscape option when printing)' is positioned between the two buttons. The dialog box has a light blue background and a thin border.

**Figure 9-1 Print Panel**



**Figure 9-2 Image of PDF generated from Print tool**

## 10 HELP

Click the help button on the menu bar to open the Help panel. There are four tabs on the panel. Along with a welcome screen, the Help panel contains information on the following tools: **Oil Spill**, **Inundation**, and **Warnings**. There is also a link to the web version of this manual.



Figure 10-1 Help Panels

## 11 DM TOOLS

Figure 11-1 shows the menu that appears after clicking on the DM button located on the right side of the menu bar. This button (and subsequent tools) is only made available to DM level users.



Figure 11-1 Screenshot of DM tools menu

### 11.1 Comparison

The Comparison tool allows DM users to compare model forecast data and observation data for the previous four days by selecting a map observation station or from the station list.

To create a comparison, choose any station from the map or the list shown in Figure 11-2.

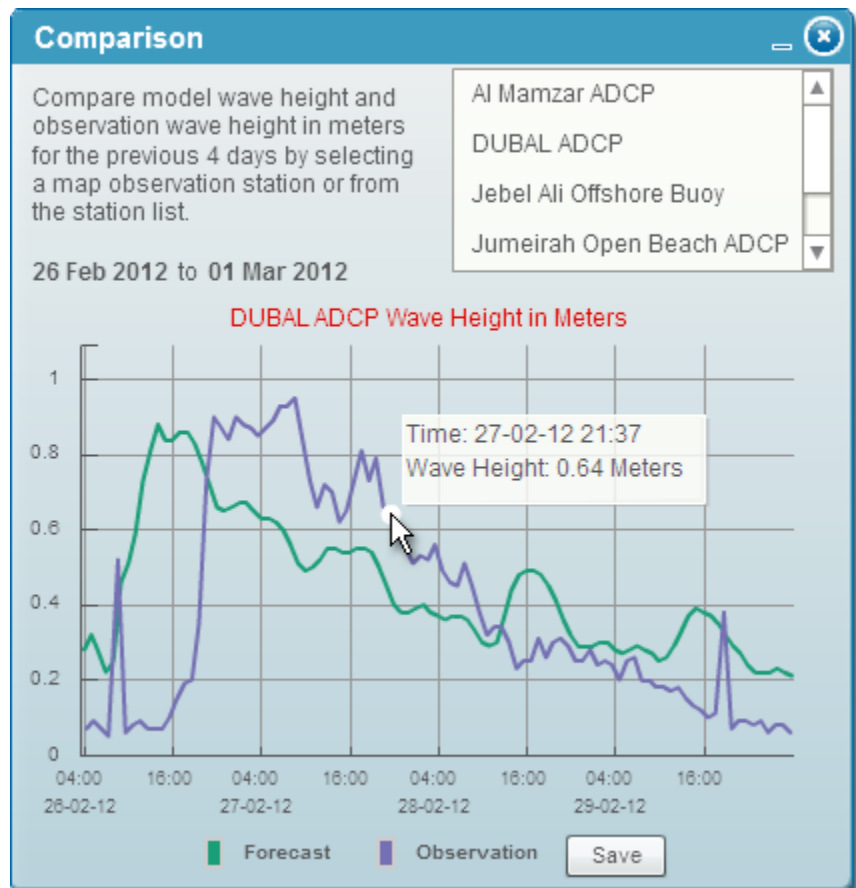
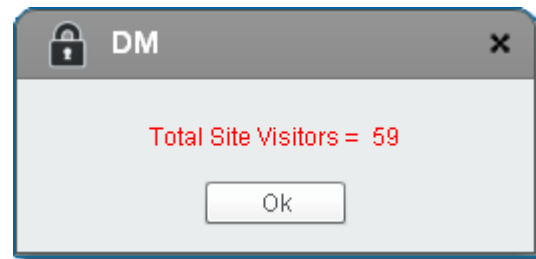


Figure 11-2 Comparison widget

## 11.2 Total Visitors

The Total Visitors tool displays the total number of users that have visited the forecasting site, to date.



*Figure 11-3 Total Visitors*

## 11.3 Shoreline on/off

This tool allows DM users to view the shoreline used by the forecast and oil spill models.. Figure 11-4 shows the map in with the **Satellite** basemap layer enabled as well as the Shoreline tool on.



*Figure 11-4 Screenshot with Shoreline On*

## 12 MATLAB DATA COMPARISON TOOL

A Matlab function called `DM_GET_TIMESERIES` has been provided to DM for extraction of model data (SWAN, WRF, and ROMS) to a user's desktop for advanced analysis. This function makes an ftp connection to the Operational Forecasting System (OFS) server currently located in Brazil and downloads the appropriate NetCDF file based on inputs of desired model and year/month/day of the model run. The function pulls out a time-series for the nearest model grid node to the input lat/lon coordinates and returns an  $m \times 2$  matrix, where  $m$  is the number of time steps. The first column of the matrix is the time coordinate and the second is the values of the desired model variable.

To install the `dm_get_timeseries` function so that it can be used in the Matlab environment, the function must be installed on the users local computer. To install the function extract the `dm_get_timeseries` folder to a directory with read/write access. Next, add the `dm_get_timeseries` folder to the Matlab search path (File→Set Path...→Add Folder...); do not choose “add with subfolders”. Typing “help `dm_get_timeseries`” at the Matlab command prompt will show whether the folder and `dm_get_timeseries` function have been added correctly.

To use the function follow these steps.

Input the command shown in Figure 12.1 to Matlab, where the arguments are (model, year, month, day, lat, lon):

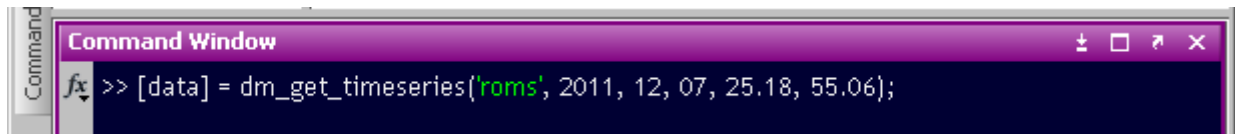
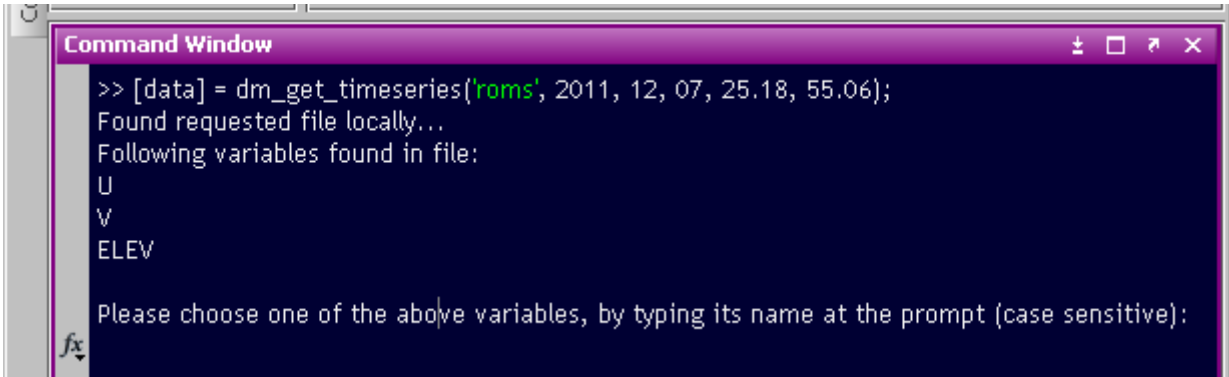


Figure 12-1 DM Get Time Series command for requesting data

Choose between `'roms'`, `'wrf'`, and `'swan'` to select the appropriate model.

Press enter to execute the command. The function will first search the `dm_get_timeseries` directory to see if the corresponding NetCDF file has already been downloaded from the ftp server. If the corresponding file has been downloaded a summary of variables available in the file will appear. Figure 12.2 shows variables returned from a ROMS file.



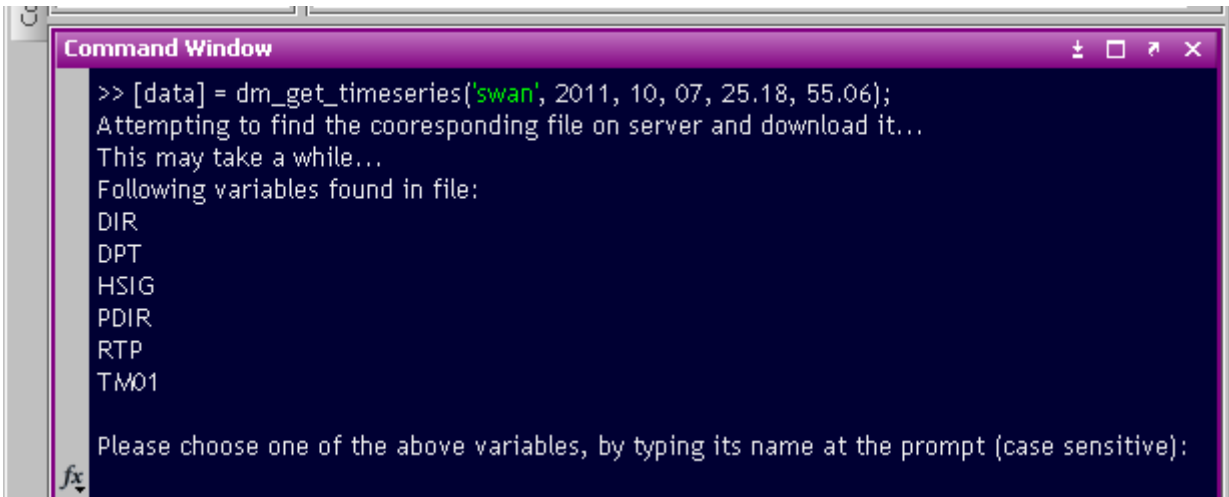
```

Command Window
>> [data] = dm_get_timeseries('roms', 2011, 12, 07, 25.18, 55.06);
Found requested file locally...
Following variables found in file:
U
V
ELEV
Please choose one of the above variables, by typing its name at the prompt (case sensitive):

```

**Figure 12-2** ROMS Variables resulting from DM Get Time Series request

If the file has not already been downloaded, the function contacts the ftp server and attempts to locate and download the correct NetCDF file. Depending on the size of the NetCDF file and internet connection speed, this may take some time (up to 20 minutes for the largest ROMS files). Once the file is downloaded a summary of the available variables will appear. Figure 12.3 shows variables returned from a SWAN file.



```

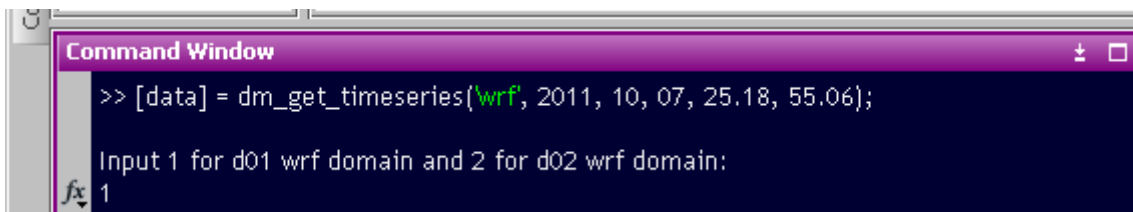
Command Window
>> [data] = dm_get_timeseries('swan', 2011, 10, 07, 25.18, 55.06);
Attempting to find the cooresponding file on server and download it...
This may take a while...
Following variables found in file:
DIR
DPT
HSIG
PDIR
RTP
TMO1
Please choose one of the above variables, by typing its name at the prompt (case sensitive):

```

**Figure 12-3** SWAN Variables resulting from DM Get Time Series request

For the WRF model data there is an additional step before the function attempts to locate the local or remote NetCDF file, in this case the user must select the desired domain at the prompt show in Figure 12.4. The WRF domains are illustrated in both the CM 10059 Phase 1 and Phase 2 reports. In the case of the dm\_get\_timeseries command domain d01 corresponds to the WRF G1 domain and domain d02 corresponds to the WRF G2 domain.

Note: though there are also two ROMS domains, it is not necessary to choose a single domain because the model results are aggregated into a single file.



```

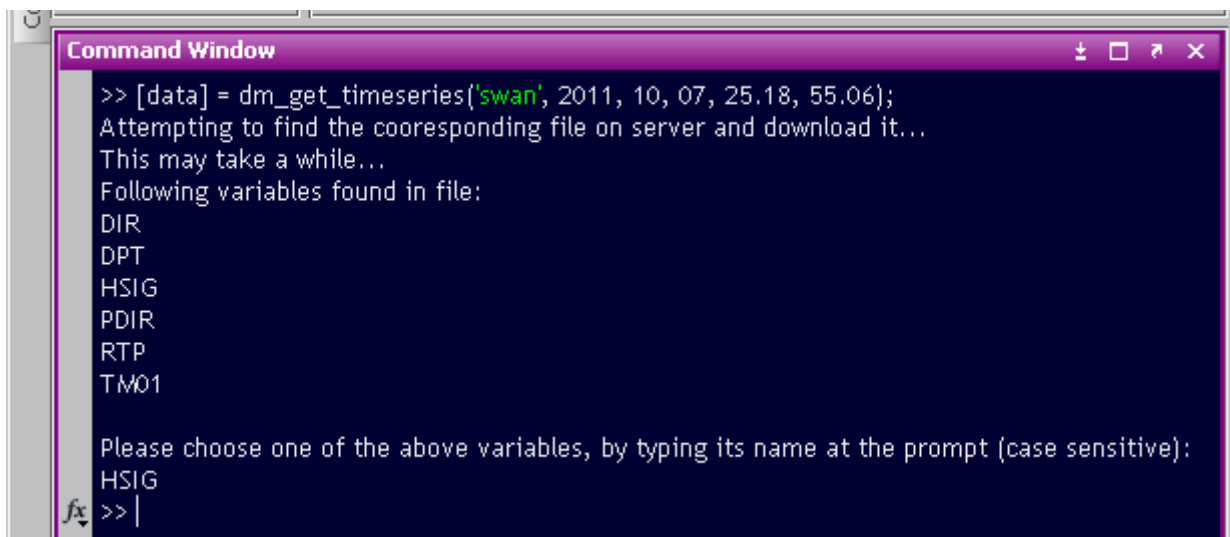
Command Window
>> [data] = dm_get_timeseries('wrf', 2011, 10, 07, 25.18, 55.06);

Input 1 for d01 wrf domain and 2 for d02 wrf domain:
fx 1

```

**Figure 12-4** DM Get Time Series options for choosing WRF domain

To extract data from the NetCDF file, type the desired variable's name at the variable prompt (Figure 12.5). Type the variable name as it appears in the list above the prompt, since NetCDF files are case-sensitive. Press enter to execute the data extraction and create a time series from the closest grid node to the lat/lon inputs. Now that the NetCDF file is local, data extraction performed on the file is quick.



```

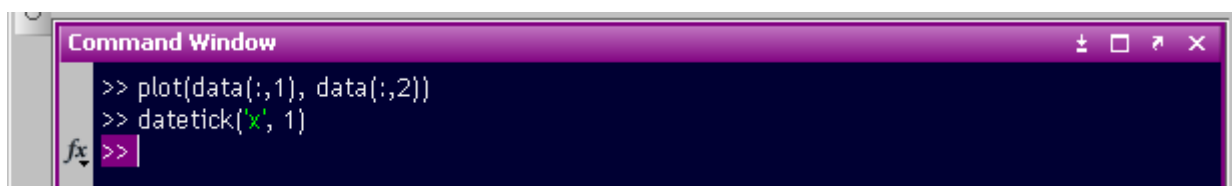
Command Window
>> [data] = dm_get_timeseries('swan', 2011, 10, 07, 25.18, 55.06);
Attempting to find the cooresponding file on server and download it...
This may take a while...
Following variables found in file:
DIR
DPT
HSIG
PDIR
RTP
TM01

Please choose one of the above variables, by typing its name at the prompt (case sensitive):
HSIG
fx >> |

```

**Figure 12-5** DM Get Time Series command variable selection

The data can now be further analyzed with Matlab. Figure 12.6 shows the command for creating a time-series plot for the SWAN data requested. Figure 12.7 shows the resulting time-series plot.

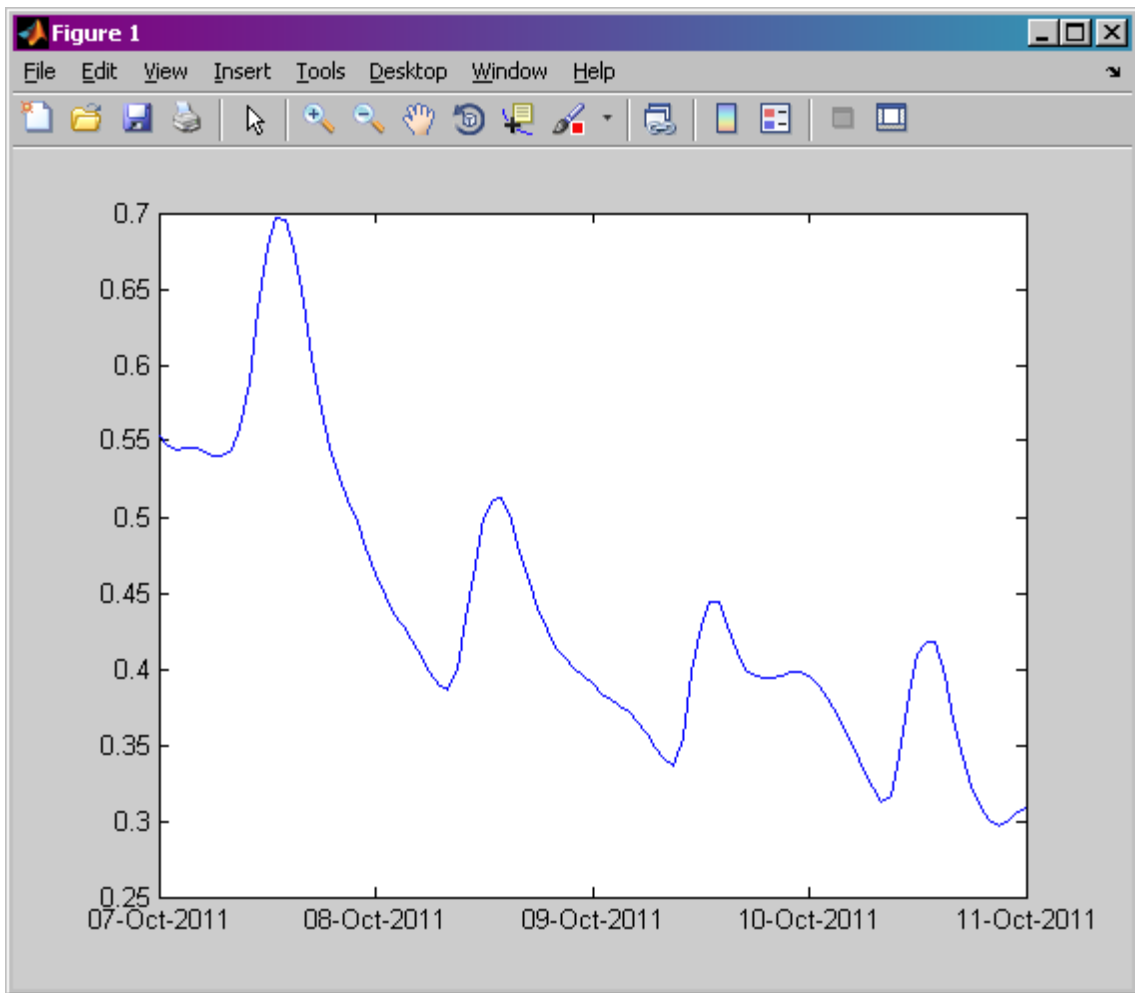


```

Command Window
>> plot(data(:,1), data(:,2))
>> datetick('x', 1)
fx >>

```

**Figure 12-6** Sample Matlab command for creating a time-series plot



**Figure 12-7** Sample time-series plot of SWAN significant wave height data