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12.1 Introduction

The Indico Map Module is an Airviro user interface, used to display time series data on maps. Data is displayed time step by time step and can be animated.

12.1.1 General Concepts

Data is displayed as numbers on the map close to the station, as different kinds of colored iso maps or as special ways of displaying wind direction and speed. Data can be shown manually going from one time step to the next, or as an animation where one time step is replaced with the next after a delay.

For the iso maps, time series data in measured points are interpolated and extrapolated to create a grid of values.

Data can be accumulated from a higher time resolution to a lower. Different accumulation types such as averages, sums and percentiles can be used.

The administrator must configure the animations before this module is used. A configuration file should be created with the following definitions: Parameter group, display types and default color scales . See a file example in the *Appendix 12A*.

12.1.2 Functionality

Unlike other Airviro modules, the Indico Map Module doesn't need Java Runtime Environment, that is JAVA JRE, to be installed and enabled in the web browser.

This Airviro module can be executed and Accessed using a PC or other device running Internet Explorer 9 (or later) or Firefox.

After entering the user name and password, a working domain must be selected and finally you must select Indico Map module.

12.2 Getting started

Once Airviro has been properly installed on the *server*, you can begin using it by typing the correct URL in your web browser.

After logging in with user-ID and password, the user must select an available domain and choose an Airviro module. (See *Figure 12.1. Select Domain and Module.*)



Figure 12.1 Select Domain and Module.

In **Current application** you can see the actually selected Module. Using the arrow button one can open another module.

Click in the arrow button **Current language** to select the language to work with. In version 4.00 this function is not available yet.

With **Logout** you can close the Airviro windows and return to the login window.



Figure 12.1 Welcome Airviro.


12.3 Main windows

When the Indico Map Module has been selected, the user gets the following options available in the Main Map Module window:

- Animation definition: Is used to define new animations. See *Figure 12.3*.
- Animations: allows you to select the available animations, previously defined by the users. For example, Rain_2_lay in *Figure 12.3*.
- Play/pause, forward, backward, first and last animation buttons: allows to play and step in the animation. See *Figure 12.2*.



Figure 12.2. Buttons.

-  This button is used to maximize the animation to the whole browser window.

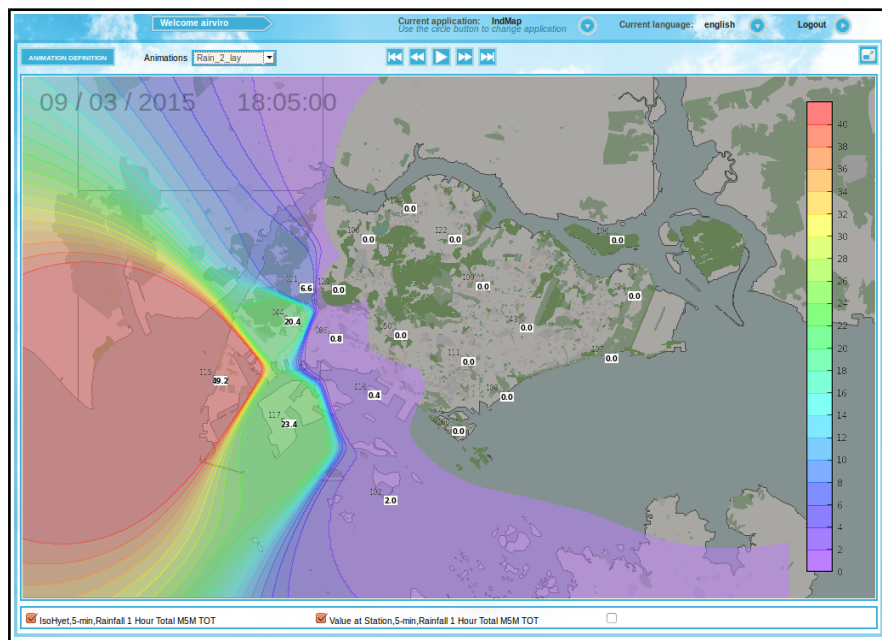


Figure 12.3 Indico Map Window.

12.4 Animation definition

In the Animations definition, the user can add, select and/or delete animations. With **BACK**, it is possible to return the previous window.

After entering the name of an animation, the next step is to define the layers used in the animation.

12.4.1 Layers

The layers are different data that are displayed on the map. Up to 3 layers can be defined. For example, layer 1 can be rain with a time resolution of 5 minutes and another layer can be wind speed.

Layers are defined with:

- **Display Type:** Select one of the available display types: Value at station, IsoHyet, IsoBar, IsoTach, IsoTerm, Wind Vector, Wind Barb, Wind Convergence, Wind Vortocity and Wind Streamline.
- **Param Group:** Measured parameters are members of groups of parameters. The Param Group is used to filter the parameter lists, I e by selecting a parameter group only the parameters that are members in that group are shown in the parameter lists. The contents of the Param Group list is depending on the selected Display Type. For example: For Display Types of wind, only the Wind parameter group appears in the list.
- **Time Resolution:** Select the time resolution for the parameters to be chosen, for example, five minutes.
- **Parameter1-2:** Used to select the parameter, for example, rainfall 1 hour total. In the general case only one parameter is chosen but for wind Display Types both wind direction and speed must be chosen. For each parameter the unit can be specified.

- **Stations:** The monitoring stations that has values for the chosen parameters are listed in “Stations”.
- **Selected stations:** The time series of the stations in the Stations list can be selected by using the arrow buttons. The double arrow buttons selects / deselects all stations from the stations list. The simple arrow button “>” copies a selected station from the station list to the Selected stations list. The “<” button deselects a selected station in the Selected stations list. The time series of the selected stations will be used to make the layers that will be shown.

12.4.2 Other Settings

Accumulation specifies the accumulation period. It is like creating a new time resolution. For example, if you select accumulation to daily values then each value used by the animations will be integrated to daily resolution from the higher time resolution.

The **Hours** setting is only used for the **x hours** setting and is specifying the number of hours used in the accumulation.

Required is the minimum required percentage of data that must exist for an accumulation. If less data exist, the accumulation will result in an empty value.

The layer is defined with a name , an accumulated type and %. The accumulation type can only be changed if an accumulation period has been specified and the % only if the accumulation type has is percentile.

If no name is entered before saving the animation a default name is constructed by the module. It contains the type of animation, time resolution and the parameters used.

In the **Accu. Type** box you can select different accumulation types. These are **mean** (sum of all the observation values in the accumulation period ÷ number of observations) , **min** (the minimum value in the accumulation period), **max** (the maximum value in the accumulation period), **sum** (the sum of all values in the accumulation period), **n°values** (the number of values within the accumulation period) and **perc** n.(percentile). **Full** generates one value for the whole specified period. This functionality is the same as in

Indico Presentation.

One can choose to animate using the latest data. That is made by checking **Real Time** and by specifying the number of values from the last measured value. An alternative is to choose a fixed period by checking **Time Period** and input the start and end time. A calendar can be used by pressing the ... button.

Figure 12.4 Animations Definition.

Click on **APPLY** to save the animation.

12.5 Display Animations

An animation over the map is displayed when an animation is selected. Layers can be enabled / disabled using the check boxes under the graph.

The date and hour of the animation step is shown in the upper left corner of the map.

If the animation chosen uses colors, a legend with a scale is displayed on the right hand side.

Its use is best explained by some examples that follows of how to use animations. For the

mathematical equations used see the equations in *Appendix 12B*.

12.5.1 Rain and Isohyet

An example of a animation with 2 layers is shown in *Figure 12.5* . These layer are isohyet and the value of rain at the stations. A legend is shown to the right with colors and limits.

This example shows the rainfall distribution map.

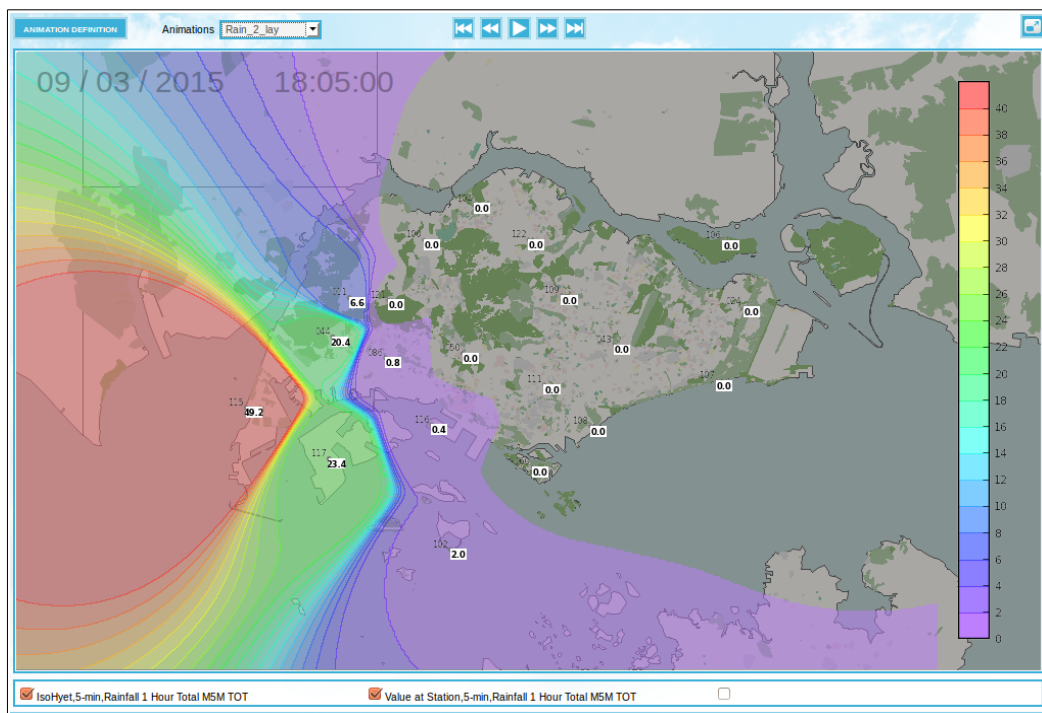


Figure 12.5 Example

12.5.2 Temperature Isotherm

Isotherms are lines that connects points on a map that have the same temperature. Therefore, all points through which an isotherm passes have the same temperatures at the time indicated.

An example of a temperature animation with 2 layers is shown in *Figure 12.6*. In this animation, colored isotherms and temperature values at stations are displayed over the

map.

The isotherms are used to divide the color-filled fields. The line between the light green and dark green is the isotherm (*Figure 12.6*)

For each station a point is displayed on map, showing the measured temperature value for the date and time that is shown in the upper left corner of the map.

One can use the **Play/pause, forward, rewind** buttons to change the date/hour.

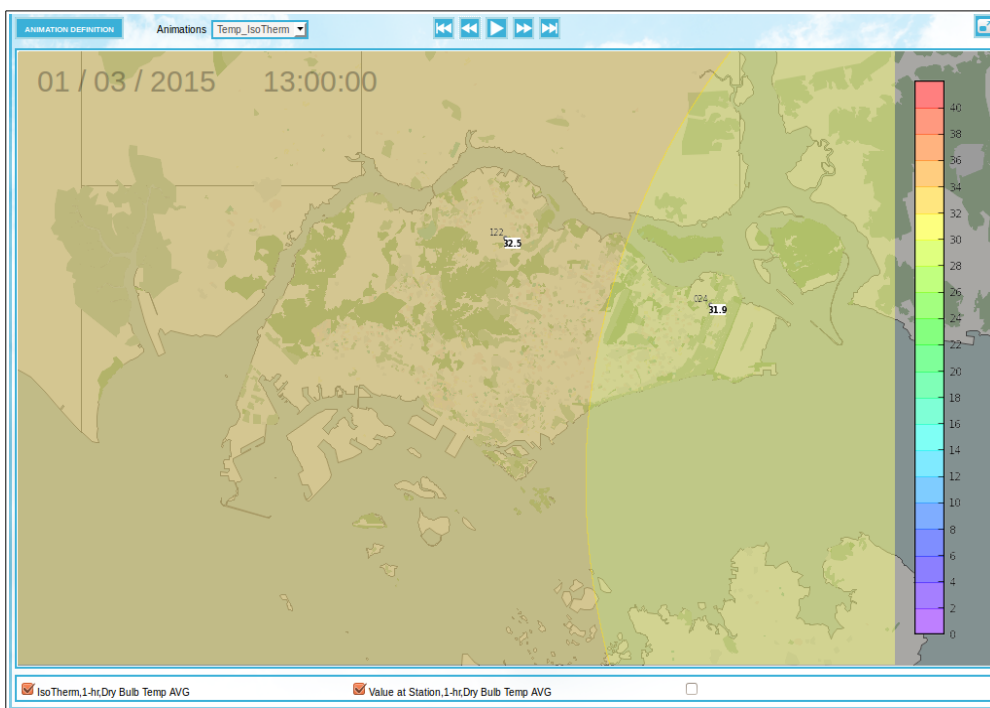


Figure 12.6 Example

12.5.3 Wind vectors

An example of wind vectors is shown in *Figure 12.7* . These vectors indicate wind direction and wind speed.

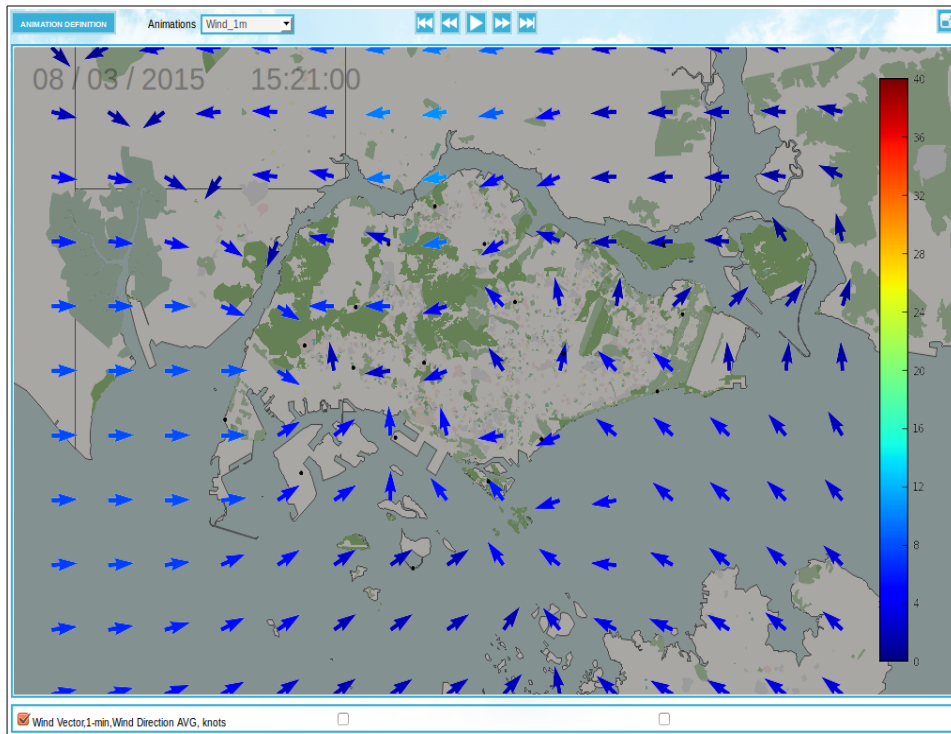


Figure 12.7 Example

12.5.4 Wind Barb

Wind barbs are the symbols used to represent **wind** speed and direction on a weather diagram or chart

An example of a wind barb: wind speed and direction, is shown in *Figure 12.8*.

The “Wind barbs” arrow points in the direction of the wind. See *Figure 12.8*.

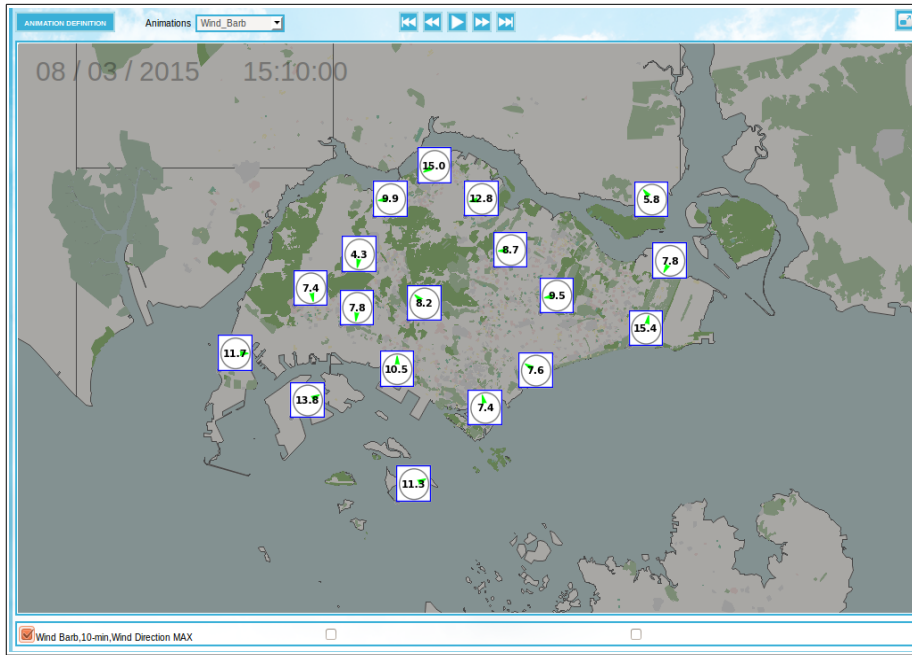


Figure 12.8 Example

12.5.5 Wind Convergence

This maps shows the flow of the wind resulting in a horizontal inflow of air into a region. Convergence of winds near the surface are associated with upward motion known in meteorology as convection

An example of a wind convergence over the map is shown in *Figure 12.9*.

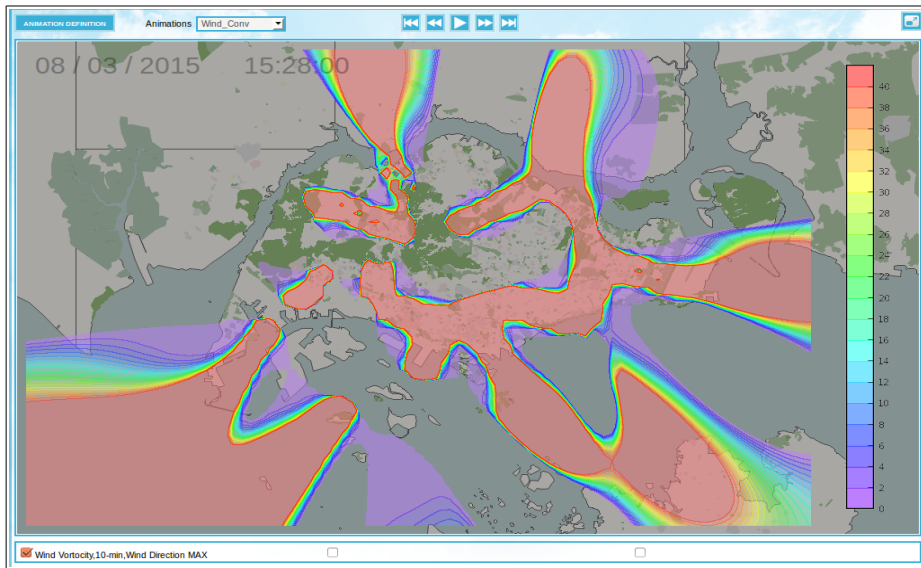


Figure 12.9 Example

12.5.6 Wind Isotach

An **Isotach** is a line joining points with the same wind speed. An example of an isotach map is shown in *Figure 12.10*. Lines are connecting points that have equal speeds.

Each map has a configurable color scale.

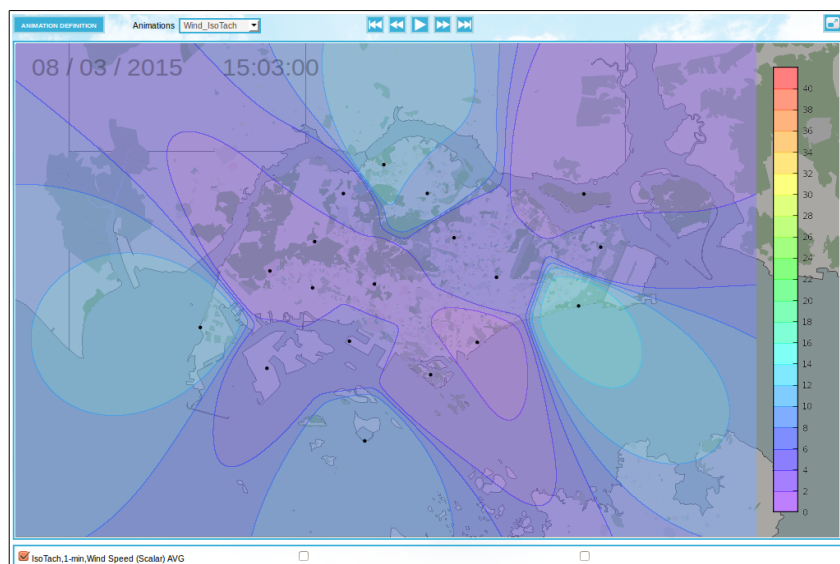


Figure 12.10 Example

12.5.7 Wind Streamline

A streamline plot is showing the wind flow direction. *Figure 12.11.*

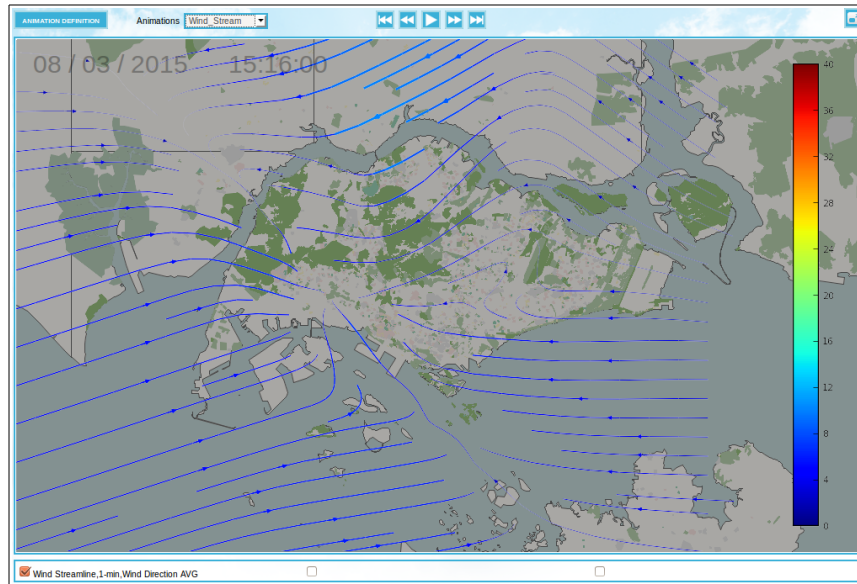


Figure 12.11 Example

12.5.8 Wind Vorticity

A wind vorticity map is showing how much the wind direction is changing horizontally. An example of a vorticity map is shown in *Figure 12.12*. For the mathematical equations used see the equations in *Appendix 12B*.

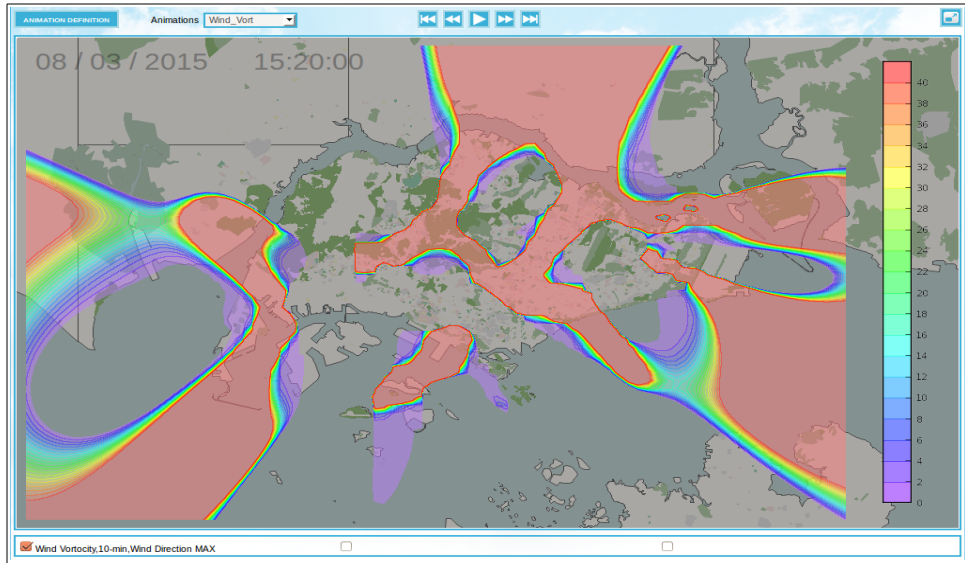


Figure 12.12 Example

Appendix 12A: Configuration.

indmap.rf

```
! Which parameter groups to show in Animation Definitions UI
!   pargrp1, pargrp2 is special case for Wind (wdir, wspd)
!
showpargrp: 0 1 2 3 4 5 6 7 8 9
subpargrp1.2: 8
subpargrp2.2: 9
!
!
! Definitions of which Display Types to show in Animation
!   Definitions UI and which parameter groups they belong to.
!
disptype.number.name: Value at Station
disptype.number.nrpar: 1
disptype.number.pargrps: 0 1 3 4 5 6 7 8 9
disptype.isohyet.name: IsoHyet
disptype.isohyet.nrpar: 1
disptype.isohyet.pargrps: 1
disptype.isobar.name: IsoBar
disptype.isobar.nrpar: 1
disptype.isobar.pargrps: 4
disptype.isotach.name: IsoTach
disptype.isotach.nrpar: 1
disptype.isotach.pargrps: 9
disptype.isotherm.name: IsoTherm
disptype.isotherm.nrpar: 1
disptype.isotherm.pargrps: 3
disptype.windvector.name: Wind Vector
disptype.windvector.nrpar: 2
disptype.windvector.pargrps: 2
disptype.windbarb.name: Wind Barb
disptype.windbarb.nrpar: 2
disptype.windbarb.pargrps: 2
disptype.windconv.name: Wind Convergence
disptype.windconv.nrpar: 2
disptype.windconv.pargrps: 2
disptype.windvort.name: Wind Vortocity
disptype.windvort.nrpar: 2
disptype.windvort.pargrps: 2
disptype.windstream.name: Wind Streamline
disptype.windstream.nrpar: 2
disptype.windstream.pargrps: 2
```

```
!  
!  
!  
! Default scales for coloured output on map for various parameters  
!  
scale.TEDB.0.levels: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34  
35 36 37 38 39 40  
scale.TEDB.0.colors: -1 #7d00ff #4b00ff #1900ff #001eff #005bff  
#0099ff #00d6ff #00ffeb #00ffad #00ff70 #00ff33 #0bff00 #47ff00  
#83ff00 #bfff00 #fbff00 #ffce00 #ff9b00 #ff6700 #ff3400 #ff0000  
!  
scale.WSPD.0.levels: 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32  
34 36 38 40  
scale.WSPD.0.colors: -1 #7d00ff #4b00ff #1900ff #001eff #005bff  
#0099ff #00d6ff #00ffeb #00ffad #00ff70 #00ff33 #0bff00 #47ff00  
#83ff00 #bfff00 #fbff00 #ffce00 #ff9b00 #ff6700 #ff3400 #ff0000  
scale.WSPD.1.levels: 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60  
64 68 72 76 80  
scale.WSPD.1.colors: -1 #7d00ff #4b00ff #1900ff #001eff #005bff  
#0099ff #00d6ff #00ffeb #00ffad #00ff70 #00ff33 #0bff00 #47ff00  
#83ff00 #bfff00 #fbff00 #ffce00 #ff9b00 #ff6700 #ff3400 #ff0000  
!  
scale.windconv.levels: -200 -180 -160 -140 -120 -100 -80 -60 -40  
-20 0 20 40 60 80 100 120 140 160 180 200  
scale.windconv.colors: -1 #7d00ff #4b00ff #1900ff #001eff #005bff  
#0099ff #00d6ff #00ffeb #00ffad #00ff70 #00ff33 #0bff00 #47ff00  
#83ff00 #bfff00 #fbff00 #ffce00 #ff9b00 #ff6700 #ff3400 #ff0000  
!  
scale.windvort.levels: -200 -180 -160 -140 -120 -100 -80 -60 -40  
-20 0 20 40 60 80 100 120 140 160 180 200  
scale.windvort.colors: #7d00ff #4e00ff #1e00ff #0015ff #0050ff  
#008aff #00c5ff #00ffff #00ffc5 #00ff8a #00ff50 #00ff15 #24ff00  
#5eff00 #97ff00 #d0ff00 #fff600 #ffc500 #ff9300 #ff6200 #ff3100  
#ff0000  
00 #ffc500 #ff9300 #ff6200 #ff3100 #ff0000  
!  
scale.isobar.levels:950 955 960 965 970 975 980 985 990 995 1000  
1005 1010 1015 1020 1025 1030 1035 1040 1045 1050  
scale.isobar..colors:-1 #7d00ff #4b00ff #1900ff #001eff #005bff  
#0099ff #00d6ff #00ffeb #00ffad #00ff70 #00ff33 #0bff00 #47ff00  
#83ff00 #bfff00 #fbff00 #ffce00 #ff9b00 #ff6700 #ff3400 #ff0000
```

Appendix 12B: Equations.

12B1. Interpolation

Inverse distance weighting interpolation/extrapolation is used where:

$$u(x) = \frac{\sum_{i=1}^N w_i(x) u_i}{\sum_{i=1}^N w_i(x)} \text{ where } w_i = \frac{1}{d(x, x_i)^p} \wedge u_i = u(x_i) \text{ for } i=1, 2, \dots, N$$

For rainfall a power of 8 is used, for all other parameters the power used is 3.

12B2. Divergence and vorticity

For large-scale systems we may use a reasonably good approximation that the vertical motion (w) is much smaller than the horizontal scale (u and v) and we can so neglect the vertical motion.

To be able to calculate divergence and vorticity from wind measurements we need to use this quasi-horizontal approximation even if the area may be too small for the approximation to be valid.

12B2.1 Divergence

$$D_{i,j} = \left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} \right)_{i,j} \approx \left(\frac{\Delta u}{\Delta x} + \frac{\Delta v}{\Delta y} \right)_{i,j} = \frac{u_{i+1} - u_{i-1}}{2 \Delta x} + \frac{v_{j+1} - v_{j-1}}{2 \Delta y}$$

12B.2. Vorticity

$$\zeta_{i,j} = \left(\frac{\partial v}{\partial x} + \frac{\partial u}{\partial y} \right)_{i,j} \approx \left(\frac{\Delta v}{\Delta x} + \frac{\Delta u}{\Delta y} \right)_{i,j} = \frac{v_{i+1} - v_{i-1}}{2\Delta x} + \frac{u_{j+1} - u_{j-1}}{2\Delta y}$$