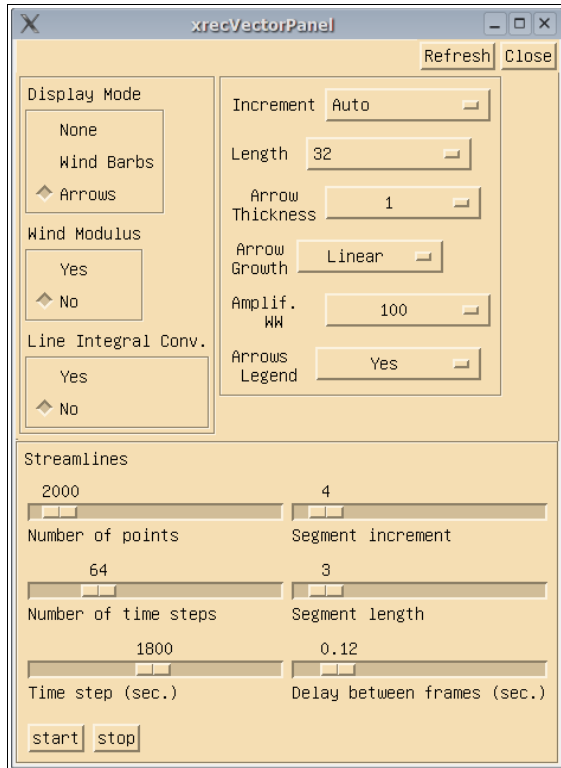


## The Vector Field Panel

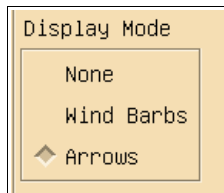
The “Vector Field” panel gives the user many options to visualize vector fields. In XREC, a vector field is defined as a pair of UU and VV components. In vertical cross sections, it is defined as a UU-VV-WW triplet.

At the present time, only UU, VV and WW are recognized as vector variables. Future version may hopefully allow the user to define his own vector variables association.



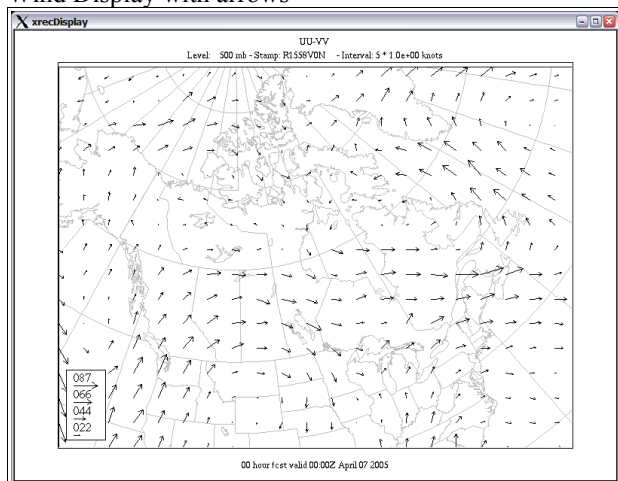
This panel is split in three parts : in the upper left there are toggles to turn on/off the display of glyphs (wind barbs, arrows), the wind modulus and line integral of convolution (from now on called LIC). In the upper right there are various options to fine tune the appearance of arrows and wind barbs. In the bottom part there are various options to fine tune the display of streamlines.

Let's start with the upper left part.

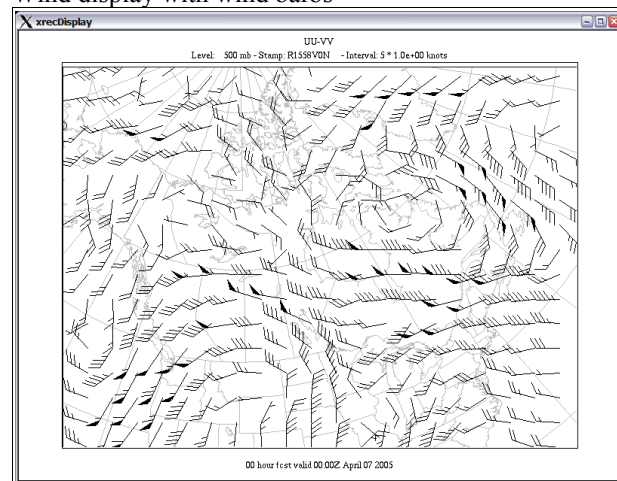


By default xrec displays vector fields with arrows. Selecting **Wind barbs** changes the arrows for wind barbs. Selecting **None** does not display anything. The **None** option is useful if the user wants to look only at the wind modulus, LIC or streamlines.

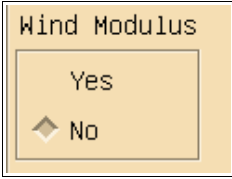
Wind Display with arrows



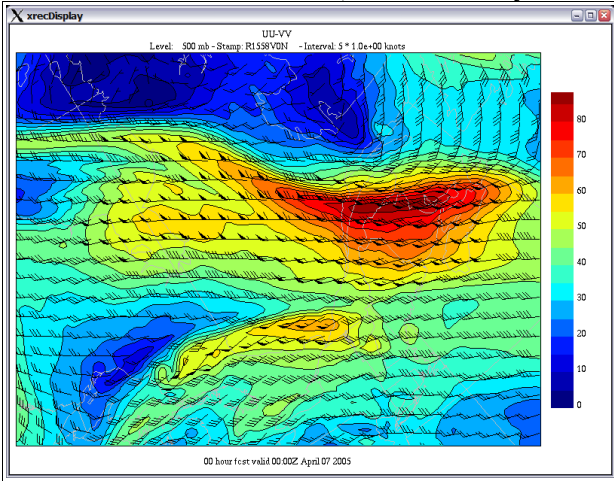
Wind display with wind barbs



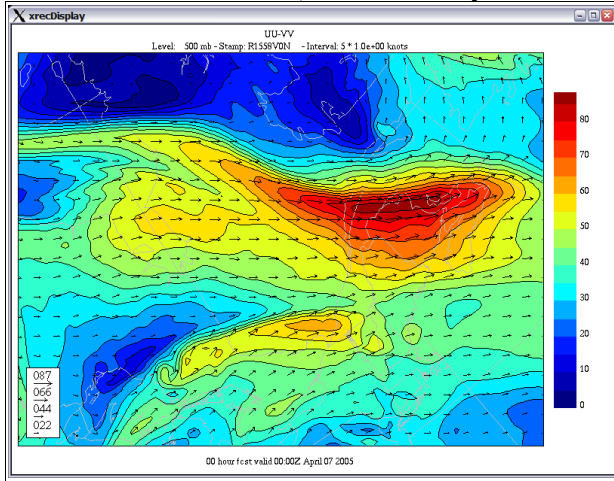
The Wind modulus toggles allows the user to display the wind modulus. The wind modulus can be shaded and contoured as any other scalar field.



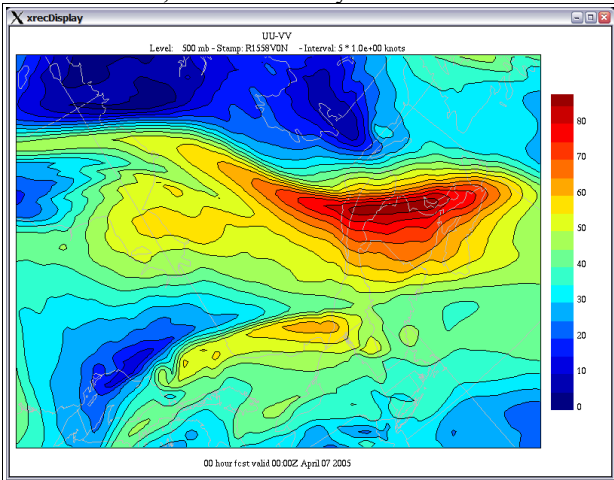
Wind Modulus with wind barbs, contoured every 5 knots



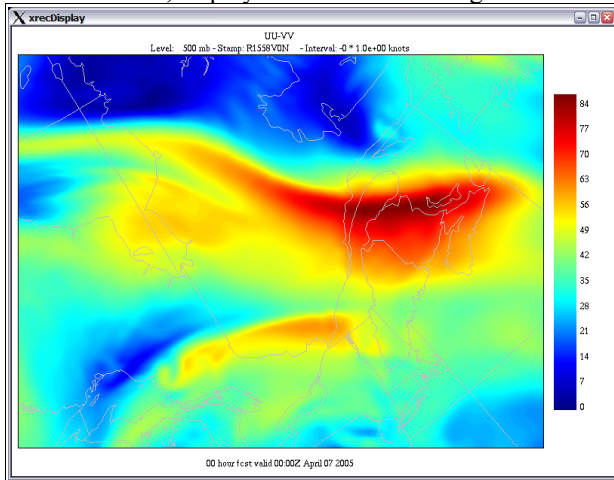
Wind Modulus with arrows, contoured every 5 knots



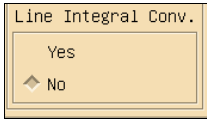
Wind Modulus, contoured every 5 knots



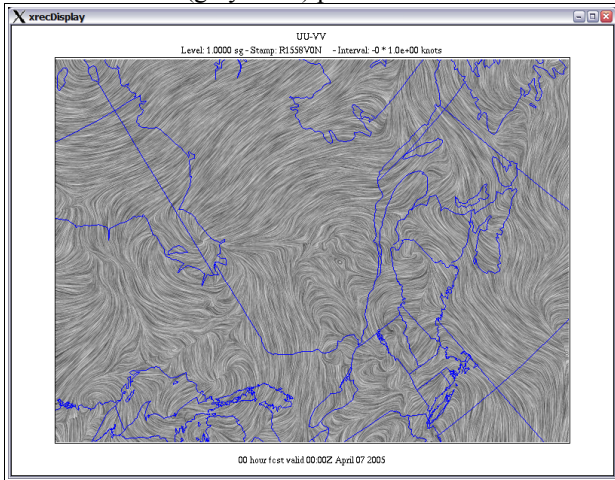
Wind Modulus, displayed in smooth shading



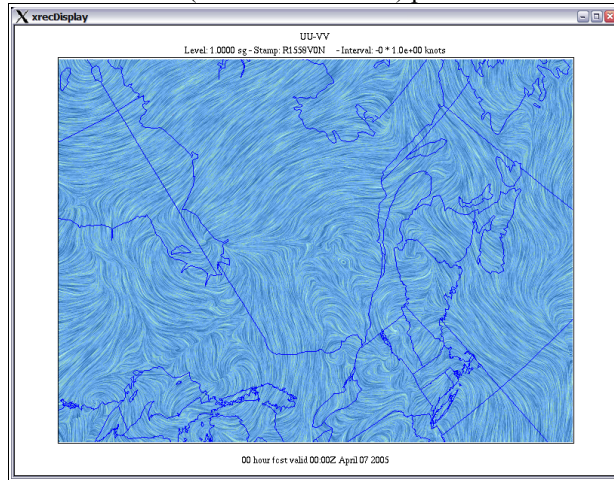
The Line Integral of Convolution is a texturing technique used to display the fine details aspects of the flow. Its use is mutually exclusive with the display of the wind modulus. You can have either one, but not both.



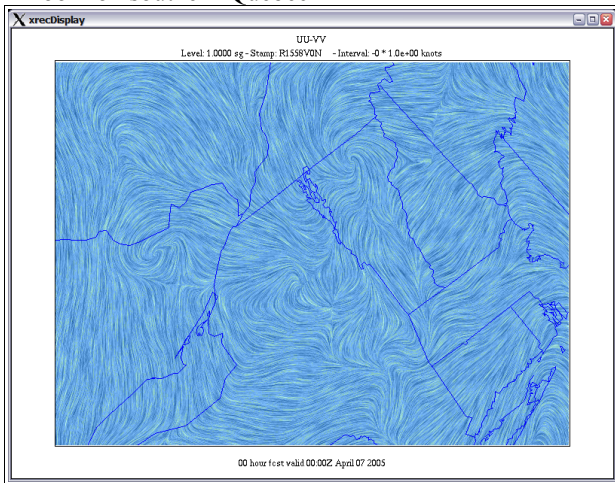
LIC with N&B1 (gray scale) palette



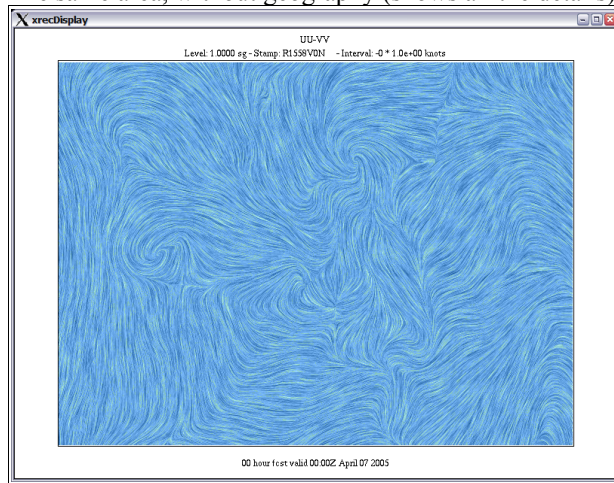
LIC with B&B1 (blue to white scale) palette



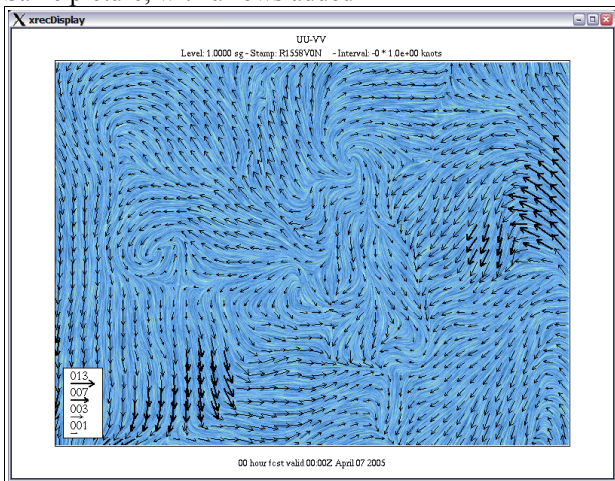
A zoom on southern Quebec



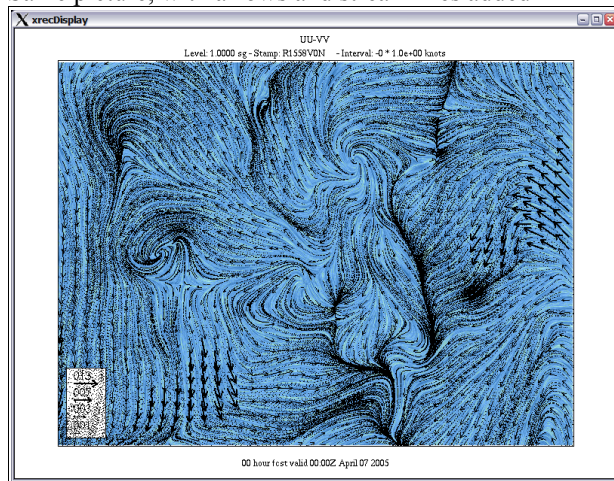
The same area, without geography (shows all the details)



Same picture, with arrows added



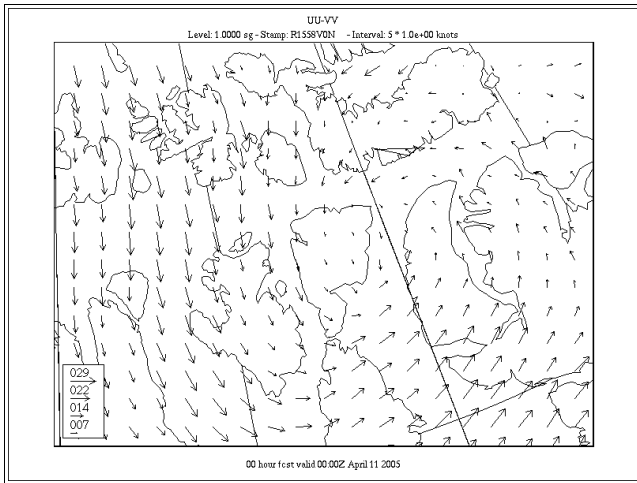
Same picture, with arrows and streamlines added



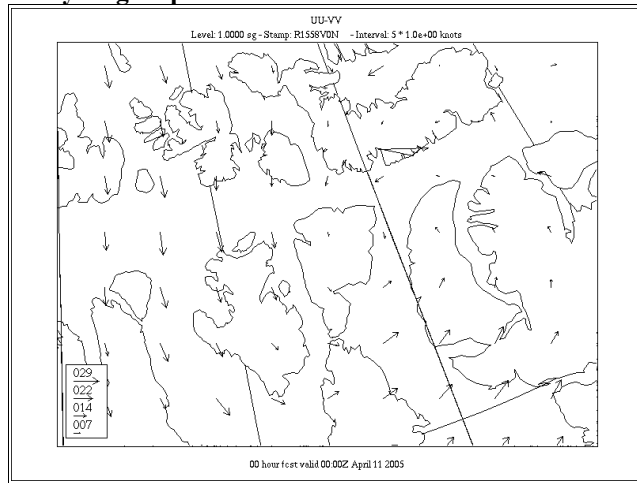
The next part of the panel offers some adjustment options on the attributes of wind arrows and barbs, such as density and length.

The first attribute is the “Increment”. It defines the space between grid points used to display the symbols. Xrec uses automatic spacing to avoid clutter. The options allow the user to override the default. Here some examples.

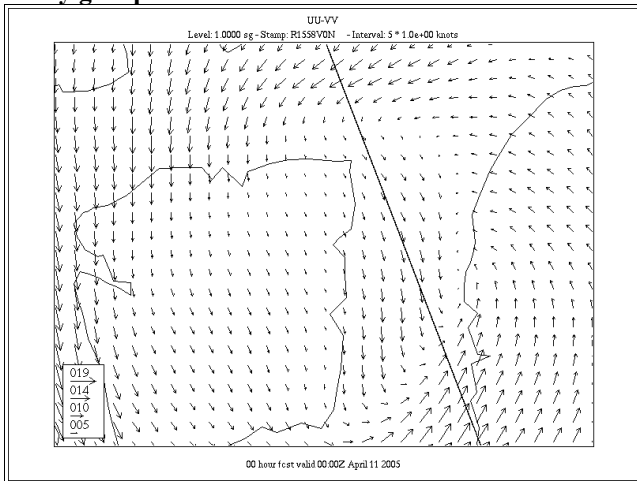
### Auto



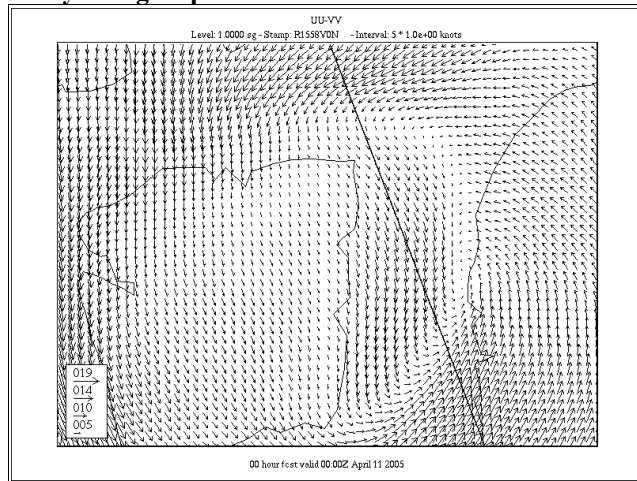
### Every 10 grid points



### Every grid point



### Every 0.25 grid point



The second attribute is the “Length”. It defines the length, in pixels, of the maximum wind speed. The default is 32.

fresh Close

8

Increment 16

24

Length 32

48

Arrow Thickness 64

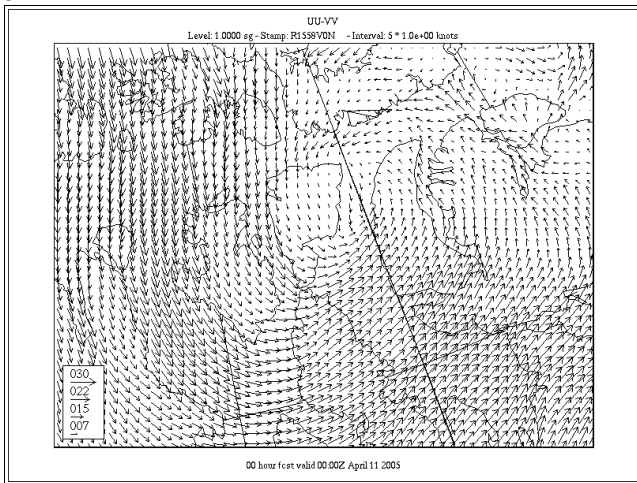
96

Arrow Growth 128

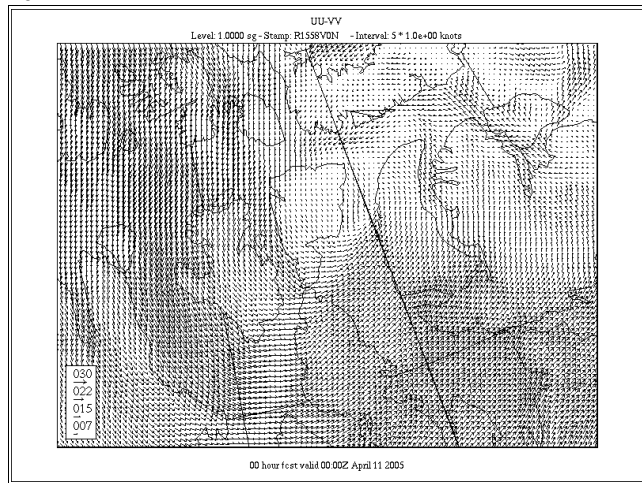
Amplif. WW 100

Arrows Legend Yes

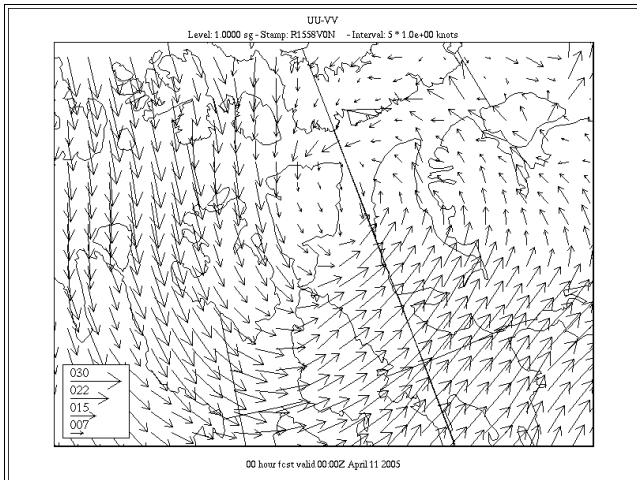
32



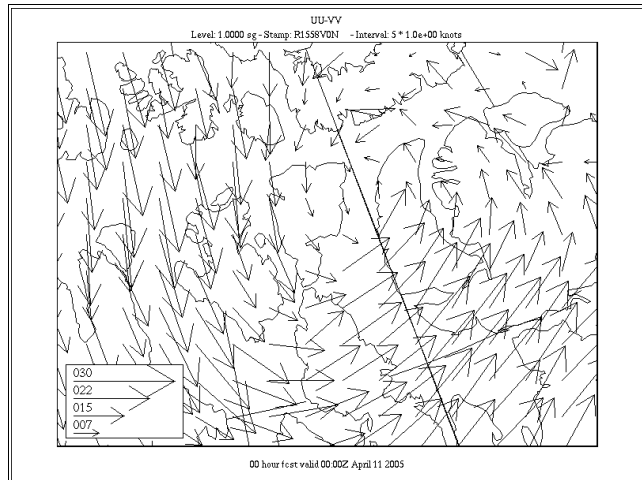
16



64



128



The third element is “Arrow Thickness”. This attributes changes the thickness of the arrows along with their speed, the arrows getting thicker as the wind speed increases. This option is useful to enhance the areas where the wind is strongest.

Increment

Length

Arrow Thickness

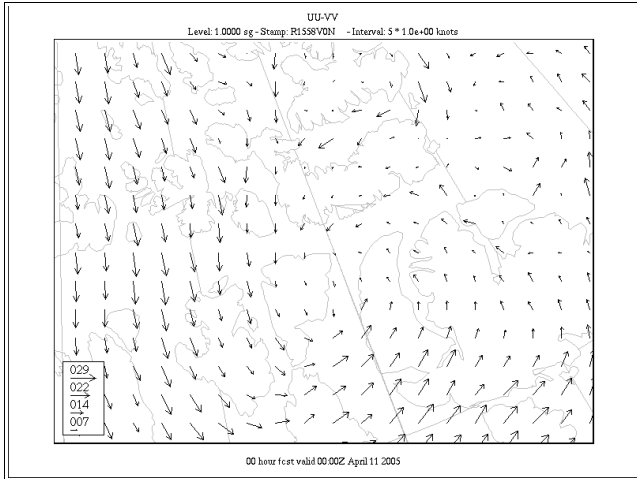
Arrow Growth

Amplif.

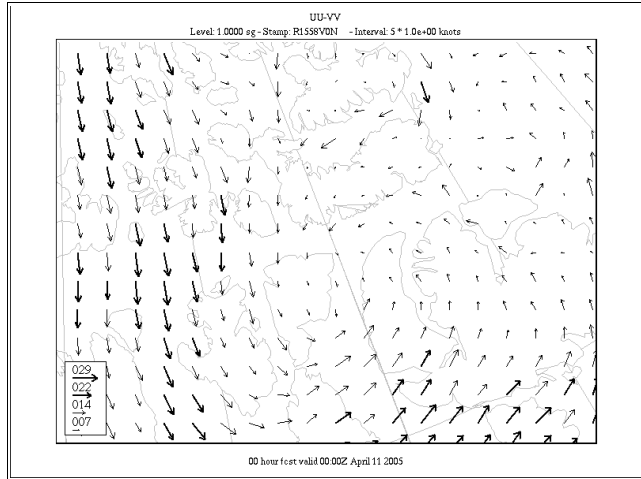
    WW

Arrows Legend

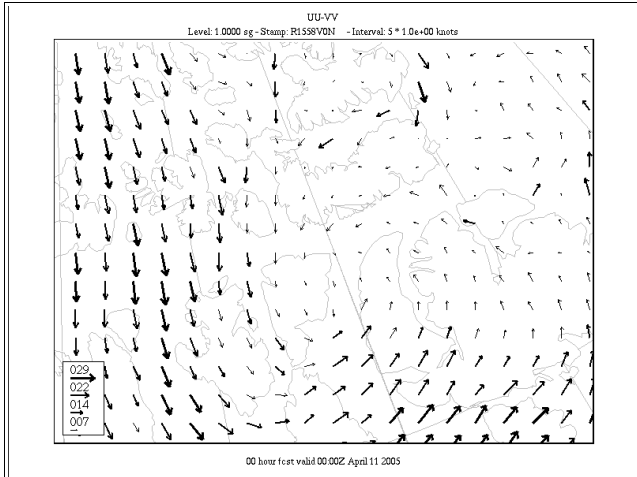
**Arrow Thickness of 1**



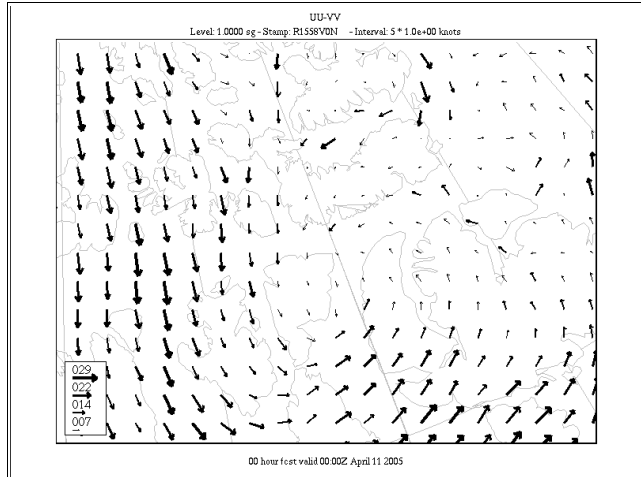
**Arrow Thickness of 2**



**Arrow Thickness of 3**



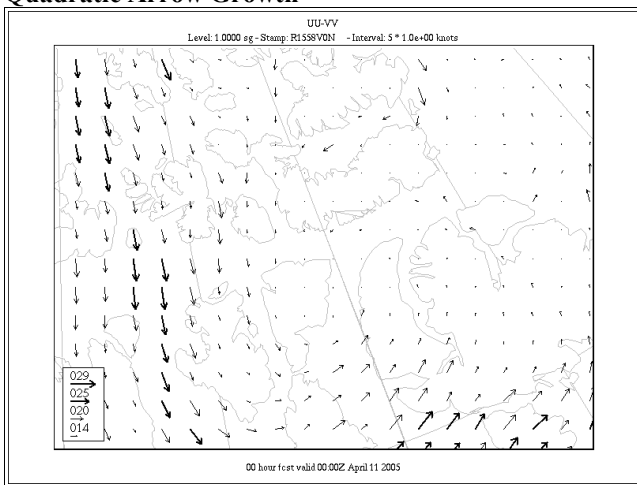
**Arrow Thickness of 4**



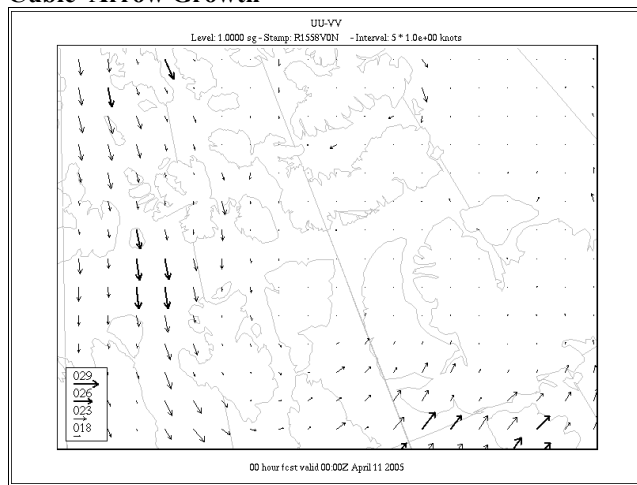
The next attribute is “Arrow Growth”, which defines the rate of increase of the thicknesses of the arrows.

Increment	<input type="text" value="1"/>
Length	<input type="text" value="128"/>
Arrow Thickne	<input type="text" value="Cubic"/>
Arrow Growth	<input type="text" value="Linear"/>
Amplif. WW	<input type="text" value="Square root"/>
Arrows Legend	<input type="text" value="Yes"/>

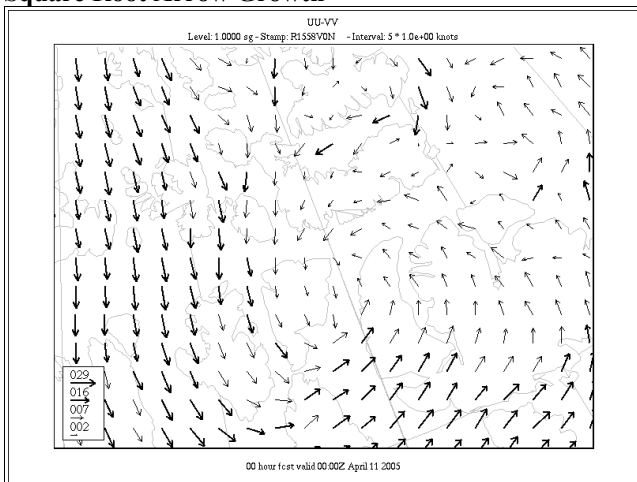
**Quadratic Arrow Growth**



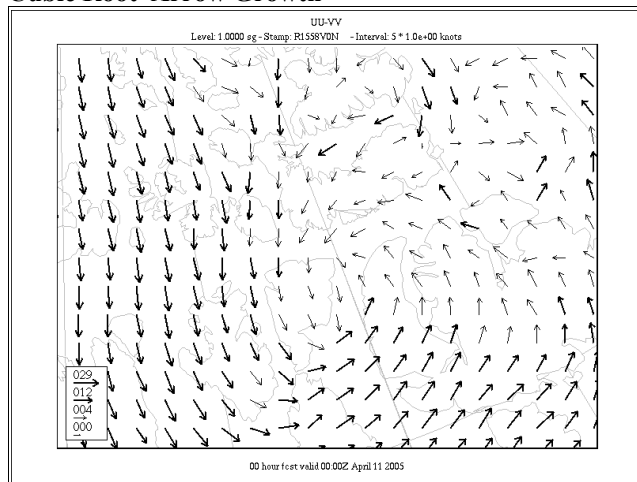
**Cubic Arrow Growth**



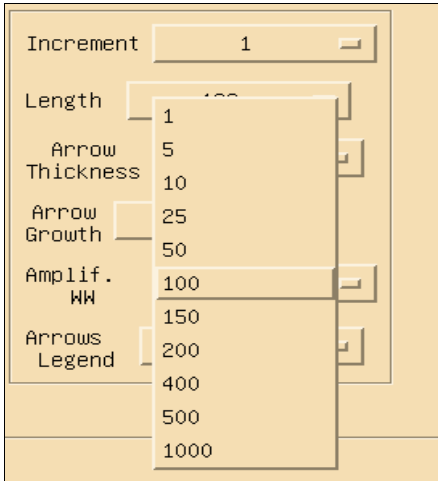
**Square Root Arrow Growth**



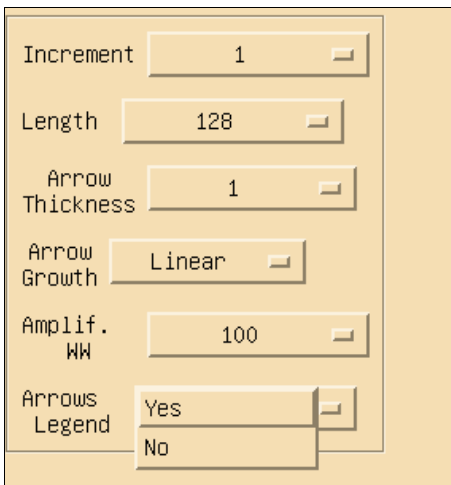
**Cubic Root Arrow Growth**



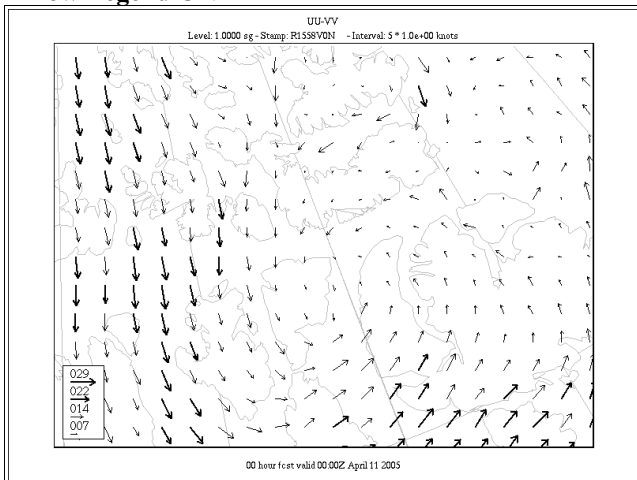
The next attribute is “Amplif. WW”, which is only used in vertical cross-sections. It defines the exaggeration factor of the vertical wind speed so that the vertical motion is “visible” in vertical cross sections of the triplets UU-VV-WW. The user can find applications of this option in the section 21 of this document, “Displaying vertical cross-sections of the wind”.



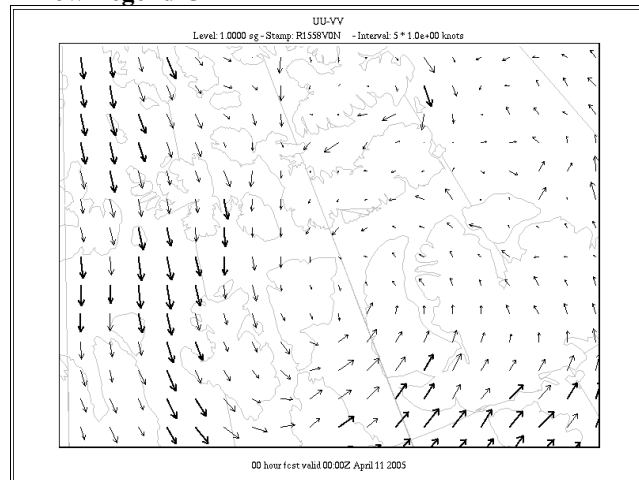
The last option of this sub-panel is “Arrows Legend”, that turns on/off the small legend at the lower left part of the window that displays 4 typical wind values, the one at the top being the maximum value. Turning that option off can be useful when the user wants to insert a picture in a publication but want to insert his own legends.



**Arrow Legend ON**



**Arrow Legend OFF**





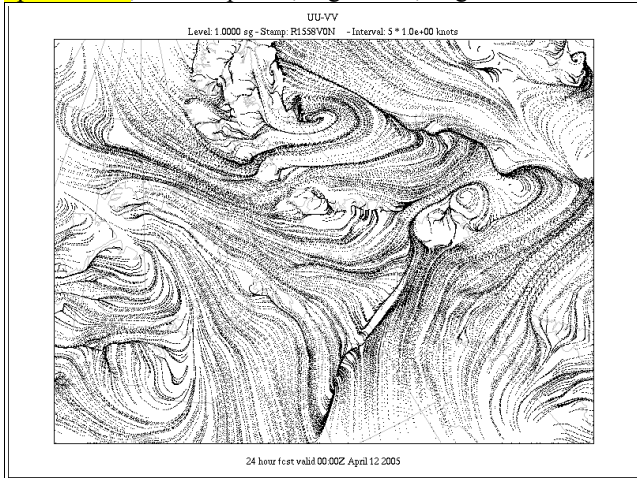
The “Streamlines” sub-panels gives the user various options to customize the display of streamlines. This part of xrec is an implantation in the program of the “xstream” utility. This algorithm uses some simple image animation trick plus simple wind advection to produce animated displays of the wind circulation. What the algorithm does is that it inject 2000 points (by default) at random locations on the grid, and advects each of these points with the wind for 64 (by default) time steps of 1800 (by default) seconds. Each streamline is displayed in groups of 4 (by default) segment increments, each of segment length 3 (by default).

This shows the instantaneous wind circulation, and highlights nicely zones of convergence and divergence.

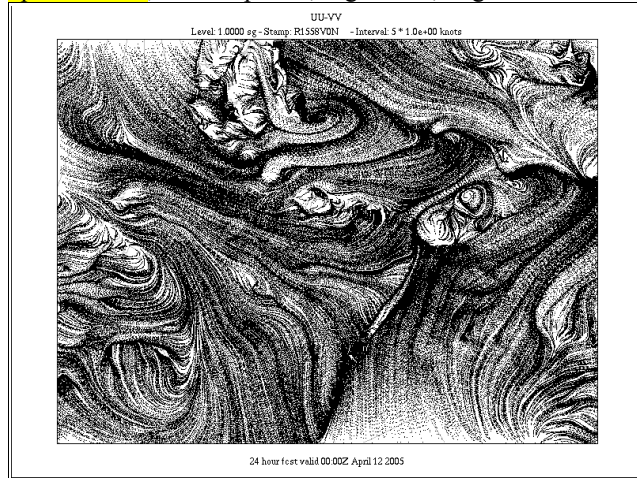
To use it, simply press on the “Start” button at the bottom of the window... To stop the animation, press the “Stop” button.

Wind display using default options

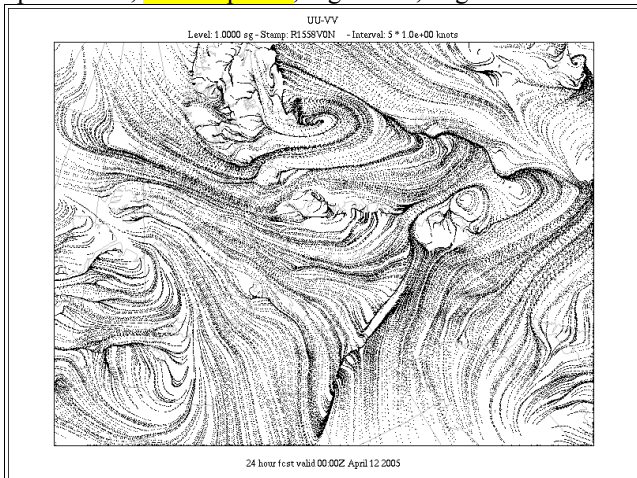
npts = 2000, time steps=64, seg. Inc. 4, Seg. Len = 3



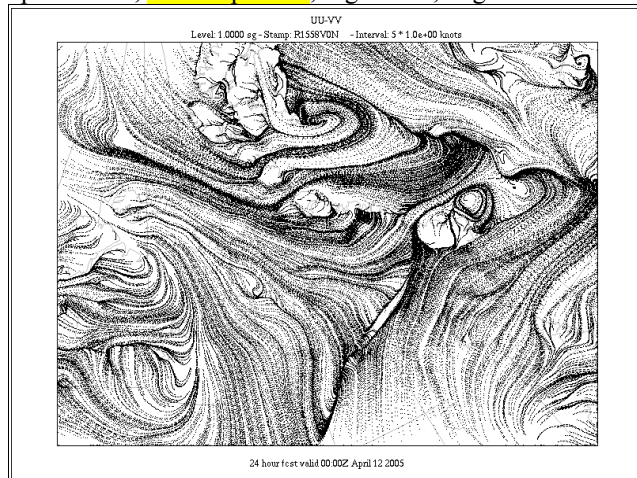
npts = 10000, time steps=64, seg. Inc. 4, Seg. Len = 3



npts = 2000, time steps=64, seg. Inc. 4, Seg. Len = 3



npts = 2000, time steps=256, seg. Inc. 4, Seg. Len = 3



The wind advection algorithm requires for the moment that the output grid has to be Polar Stereographic. If you are trying to use this option on a different type of grid you will get the following warning.

