Exercise 1: Front evaluation
& Wingridds practice

1. Open the program Wingridds:

2. Select and open the model forecast file:
   a. In the menu, click on the "opening file" icon.
   b. Select and open the following file: **MAR030900.AVN003**

3. Change the area of analysis by typing the following command in the command line:

   AREA 19 80 38 — *This changes the map area. It sets a central point in 19N 80W, and a north-south aperture of 38 degrees.*

4. To evaluate the Mean Sea Level Pressure (PMSL) please type:

   PMSL CIN2 — *This command plots mean sea level pressure using a coutour interval of 2 hectopascals.*

5. To overlap the 1000-500 hPa thickness type:

   THCK CI30 DOTS/ — *The command "THCK" plots the thickness of the 1000 hPa – 500 hPa layer by default. "CI30" sets a coutour interval of 30 meters and "DOTS" sets the linestyle to dashed lines.*

Wingridds legend on screen:

```
INPUT 4 CHARACTER COMMANDS AND DELIMITERS OR EXIT
WPL2:LVL=850:LYR=1000/500 :FHR= 0:FHRS= 0/24::FIL1=JU120400.AVN-PL
2004/7/12/0--THCK
```

In the legend, "**LYR**" defines the layer, and the command "**THCK**" plots the thickness for that layer. The default is the 1000/500 layer, which is specified in the INITGRID.SPC file. The following values can be found in the file:

```
8501000 500  0   0  24
151000 950 900 850 800 750 700 600 500 400 300 250 200 150 100
13  72  66  60  54  48  42  36  30  24  18  12  06  00  00  00  00 00  00  00 1
```

Interpretation: In the first line, 850 hPa is the default level, 1000 500 is the layer, 0 is the initial time, and 0 24 are the periods to consider when evaluating temporal differences.

Layer thicknness is computed using two levels. When cold air is present, the column contracts and the thickness decreases. When warm air is present the column expands and thickness increases. We can thus infer that cold air can be found in the regions where thickness values are low.

We can look into the thickness gradient to identify fronts, where the gradient suggests a change of airmass in the horizontal. The front is drawn in the warm side of the gradient.

¿In the graphic, one can see a thickness gradient that can suggest the presence of a front. Where exactly would the front be placed?
¿How far does the front extend?

6. Plot again mean sea level pressure via the following command:

PMSL CIN2

Another option is to click in the screen where it says ***"Command History"*** *until you can find the previously typed command you would like to retype, and press* ***"GO"*** *to execute it. This avoids the need to retype.*

Calculating the difference between two scalars. This can be calculated using the command SDIF. It will compute the value of the first scalar minus the second scalar.

7. 1000-850 hPa Layer Thickness.

7a. Can be computed with the difference between two scalars (method 1):

SDIF HGHT 850 HGHT 1000 DOTS CIN7/

This command graphs the thickness of the 850-1000 hPa layer. It uses an interval of 7 meters and dotted lines.

- In the graphic, is there a gradient consistent with the presence of a low-level front?
- Does this coincide with the previously observed?

7b. Can be defined (method 2, the other alternative):

SLYR 1000 850

This command defines a layer temporally. Having a layer defined will allow us to take advantage of several program options. The command SLYR allows us to define or change the layer during a sesión. Once the program is restarted it will use the default values. Remember the INITGRID.SPC *file?*

```
INPUT 4 CHARACTER COMMANDS AND DELIMITERS OR EXIT
WPL2:LVL=850:LYR=1000/850 :FHR= 0:FHRS= 0/24::FIL1=JU120400.AVN-PL
2004/7/12/0--THCK
```

Note: As soon as a command is executed, the new layer will be displayed in the legend.

7c. Compare thickness against mean sea level pressure:

THCK CIN7 DOTS/PMSL CIN2

Now we can graph the isobars at an interval of two hPa and overlay them to the 1000-850 hPa thickness using a 7 meter interval.

- What is the benefit of using the 850-1000 hPa layer thickness instead of that of the 500-1000 hPa layer?

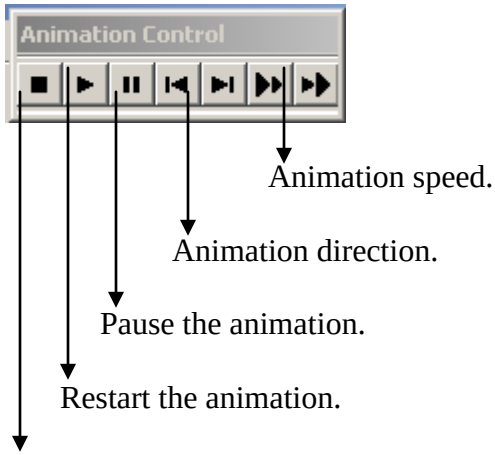
8. To generate an animation of mean sea level pressure and 1000-850 hPa thickness, write the following command:

THCK CIN7 DOTS/PMSL CIN2/ANIM

Placing the command "ANIM" at the end of the line of commands allows us to anímate the fields. The animation can be controlled using the following graphic window:

Please see below for instructions on how to use this animation control window.

ANIMATION CONTROLS



- At forecast hour f12, how many fronts can you depict?
- At forecast hour f48, how many fronts are there? What happened with the fronts?
- At forecast hour f72, where is the front?
- At forecast hour f84, where is the front?

Please stop the animation.

9. Animation of mean sea level pressure and boundary-layer temperature.

PMSL CIN2/TEMP CIN2 B015 DOTS/ANIM

This command combination generates an animation of the mean sea level pressure overlapped to the isotherms (TEMP) that represent boundary-layer data.

- What is the B015 level?
- At forecast hour f12, how many fronts can be depicted?
- At forecast hour f48, how many fronts can be depicted? What happened with the fronts?
- At forecast hour f72, where is the front?
- At forecast hour f84, where is the front?
- What is the advantage of using thickness instead of using temperature at a single level?

Please stop the animation.

10. Animation of mean sea level pressure and boundary-layer dewpoint.

PMSL CIN2/DWPT CIN2 B015 DOTS/ANIM

This combination of commands produces an animation of the mean sea level pressure overlapping the boundary-layer isodeosotherms (DWPT) or boundary-layer dewpoint isopleths.

- Can we use dewpoint temperature ot find fronts?
- At forecast hour f12, how many fronts can be depicted? Is the contrast more obvious tan when we used boundary-layte temperatures?
- At forecast hour f48, how many fronts can be depicted? What happened to the fronts?
- At forecast hour f72, where is the front?
- At forecast hour f84, where is the front?

Please stop the animation.

11. Animation of mean sea level pressure, boundary-layer temperature and boundary-layer dewpoint.

PMSL CIN2/TEMP CIN2/DWPT CIN2 B015 DOTS/ANIM

This combination of commands generates an animation of mean sea level pressure, boundary-layer temperature and boundary-layer dewpoints.

- What does the color purple show?
- What does the color yellow show?
- What does the blue/light blue line show?
- Do you consider that including these parameters eases the depiction of the fronts, or does it make it more difficult? Is it practical to see that many parameters/colors?

Please stop the animation.

12. Animation of mean sea level pressure and boundary-layer equivalent potential temperature.

PMSL CIN2/THTE CIN3 B015 DOTS/ANIM

This combination of commands generates an animation of the mean sea level pressure and the equivalent potential temperature isopleths (THTE) in the boundary layer.

- In what does the equivalent potential temperature depend upon?
- How can we use these parameters to identify boundaries?
- How many gradients can be observed at time F24?
- What can be associated with the gradient observed across the Lesser Antilles?
- Was this gradient observed when the temperature and dewpoint temperature fields were analyzed?
- Can this gradient be associated with a baroclinic boundary?
- How many fronts can be seen by 60-72 hrs?
- What happens to the gradient across the Lesser Antilles by 72-84 hrs?

Please stop the animation.

13. Macro to evaluate fronts:

PEPT.

This macro is a combination of commands that the user will use frequently. A macro saves time. Without them the user would have to type and retype commands repetitively.

The macro "PEPT." Generates an animation of mean sea level pressure, the 1000-850 hPa thickness, and equivalent potential isotherms inside the boundary-layer (B015).

- What do purple contours show?
- What do yellow contours show?
- What do light blue contours show?
- What is the use of combining thickness with equivalent potential temperature?
- At forecast hour F24, does this help to evaluate the boundary across the Lesser Antilles? What can be deduced about this boundary's nature?

Please stop the animation.

14. Temperature advection.

14a. Using flow and temperatures.

PMSL CIN2/BKNT/TEMP CIN2 B015 DOTS F12

This command shows mean sea level pressure, flow and boundary-layer temperatures.

- What compone does the wind have with respect to the isotherms in the Gulf of Mexico, western Caribbean and Atlantic?
- What type of advection is expected under these conditions (positive, negative or neutral)?
- Where do we expect the strongest cold advection?
- Is this a subjective or an objective way to evaluate advection?

14b. Computing temperature advection explicitly.

LAST GT00 CLR6/ADVT TEMP WIND CLR7/

This command can be used to plot temperature advection by the boundary-layer winds over the previous graphic.

- What type of advection do the blue contours show?
- Where can the strongest cold advection be found?
- How does this correlate to the previously analyzed?

15. Objective way to quantify thickness change.

15a. Tendency between 24 and 48 hrs.

SDIF THCK F36 THCK F12 DPOS *This command is used to evaluate the change (tendency) of thickness in the 1000-500 hPa layer between 12 and 36 hrs. The command DPOS plots positive values using dotted lines, and negative values using solid lines. This helps to visualize positive versus negative values.*

- What is the implication of positive versus negative changes?
- What contour interval was used to plot thickness change between F36 y F12?
- How many areas of thickness decrease can be depicted in the Atlantic and Northern Caribbean Islands?

15b. Controlling the contour interval.

LAST CIN5 DPOS *The command "**LAST**" repeats the last command used. In this case, we are repeating "SDIF THCK F36 THCK F12". The command "CIN5" modifies it to a 5-meter contour interval. The command "DPOS" plots the positive valuesusing dotted lines and the negative ones using solid contours. This helps with the contrast aiding visualization.*

- How many areas of thickness decrease can be depicted in the Atlantic and Northern Caribbean Islands?

15c. Tendency between 12 and 60 hours.

SDIF THCK F60 THCK F12 DPOS *This command is used to evaluate the change in the 1000-500 hPa-layer between 12 and 60 hours. The command "DPOS" the positive valuesusing dotted lines and the negative ones using solid contours. This helps with the contrast aiding visualization.*

- Where can we see positive/negative tendencies?
- What could this imply for the islands of the Northern Caribbean?
- How strong is this frontal incursion in the Caribbean basin?

16. Temperature tendencies inside the boundary-layer.

SDIF TEMP F60 TEMP F12 CIN2 DPOS B015

This command compares boundary-layer temperatures between 12 and 60 hours.

- Where do we see positive/negative tendencies?
- What is the tendency to the north of the islands? What is the tendency across the Eastern Caribbean?
- How does this correlate to thickness tendencies?

17. Dewpoint tendencies inside the boundary-layer.

SDIF DWPT F60 DWPT F12 CIN2 DPOS B015

This command allows us to compare the tendency of boundary layer dewpoints between F12 and F60.

- What is the tendency across the greater Antilles / Northern Caribbean?
- How do tendencies and thickness correlate?

18. Equivalent potential temperature tendency in the boundary-layer.

SDIF THTE F60 THTE F12 DPOS CIN5 B015

This command allows to compare boundary-layer equivalent temperature tendencies between forecast hours 12 and 60.

- Where do we see positive/negative tendencies? How high/low are these over the Greater Antilles?
- Compared against temperature and dewpoint tendencies, which are higher or lower? Why this difference? (Remember that equivalent potential temperatures take into consideration sensible temperature and the latent heat released during condensation).
- How does this correlate to thickness tendencies?

19. Fronts and shear lines.

19a. Create an animation of winds and thickness at 850 hPa.

BKNT/THCK CIN7 DOTS 850/ANIM

These command creates an animation of the 1000-850 thickness at an interval of 7 meters. It also plots the 850 hPa windspeed in knots.

- Where is the col at forecast hour f12?
- Is there a shear line during this period? Where is it?
- Is there a pre-frontal trough? Where is it?

- Where is the col at forecast hour f36?
- Is there a shear line during this period? Where is it?
- Is there a pre-frontal trough? Where is it?

- Where is the col at forecast hour f72?
- Is there a shear line during this period? Where is it?
- Is there a pre-frontal trough? Where is it?

Please stop the animation.

19b. Creating an animation of 850 hPa streamlines and thickness.

STRM WIND 850/THCK CIN7 DOTS/ANIM

These commands create an animation of 1000-850 layer thickness at a 7-meter interval, and 850 hPa streamlines.

- At forecast hour F12, in relation to the front, where do we see the confluent asymptote in the Caribbean Sea?
- Is this representative of a surface shear line?

This demostrates the 850 hPa (~1500 meter) flow. This flow is not necessarily representative of the surface flow.

- At forecast hour F48, in relation to the front, where can we find the confluent asymptote in the Caribbean Sea?
- At forecast hour F78, in relation to the front, where can we find the confluent asymptote in the Caribbean Sea?

Please stop the animation.

19c. Creating an animation of thickness and streamlines at 1000 hPa.

STRM WIND 1000/THCK CIN7 DOTS/ANIM

*Click on **"Command History"** until you can see the previous command, and replace the "850" level with the "1000" level. Then, click on **"GO"** to execute the command. This sequence creates an animation of the thickness at the 1000-850 layer every 7 hours, and streamlines at the 1000 hPa level.*

- At forecast hour F12, in relation with the front that extends over the islands, where can we find the confluent asymptote over the Caribbean Sea?
- Is this further north or further south than the observed at the 850 hPa level?
- Is this representative of the surface shear line?

Although more representative than the 850 hPa level, flow at 1000 hPa is not necessarily representative of the surface flow since it does not take into account the orography. It is though a good approximation.

- At forecast hour F48, in relation to the front, where do we find the confluent asymptote over the Caribbean Sea?
- At forecast hour F78, in relation to the front, where do we find the confluent asymptote over the Caribbean Sea?

Please stop the animation at hour F12.

Now lets overlay the 850 hPa streamlines. Type the following command:

STRM WIND 850 F12/ *This command overlays 850 hPa winds at F12***.**

- Which is further north? The 850 hPa asymptote or the 1000 hPa one?

19d. Create an animation of thickness and boundary-layer streamlines.

STRM WIND B015/THCK CIN7 DOTS/ANIM

*Click on **"Command History"** until you can find the previously typed command. Then change the "1000" for "B015" and then click on **"GO"**. These commands créate an animation of the thickness of the 1000-850 layer at a 7-meter interval and boundary-layer (B015) streamlines overlayed.*

- At forecast hour F12, in relation to the front that extends over the islands, where do we find the confluent asymptote over the Caribbean Sea?
- Is this further north or south than the observed at the 1000 hPa level?
- At which period do we see the confluent asymptote moving over Puerto Rico and the Virgin Islands?

Since the boundary layer flow follows the terrain, it is, in theory, more representative of the near surface flow than the flow at any given level.

Please stop the animation.

20. Evaluation of areas of **convergence** and **divergence** at low-levels in relation to the front and confluent asymptote (shear line/línea de cizalladura o línea de cortante).

Generate a field with the flow at 1000 hPa, the 1000-850 hPa thickness and low-level convergence.

WDVR LT00 CLR6/WDVR CLR7/STRM WIND 1000/THCK CIN7 DOTS/ANIM

This sequence of commands creates an animation of 1000-850 hPa thicknes at a 7-meter interval, 1000 hPa streamlines, and areas of convergence/divergence. Note that convergence appears in red.

- At forecast hour F12, how is convergence distributed with respect to the front and the confluent asymptote?
- Where is the strongest convergence?
- What can be observed in southern Central America and northern Colombia?
- What impact can this have once we consider vertical motion?

- At forecast hour f60, how is convergence distributed with respect to the front and the confluent asymptote?
- What is the tendency during this period?

- What is the tendency for the 72-84 hrs period?

21. 4-Panel Evaluation.

21a. Changing to 4-panels.

4PNL *This command displays data in four different panels or windows.*

NOTE: The plotting area needs to be redefined every time you change the plotting mode from 1 panel to 4 panels or viceversa.

21b. Changing the plotting area.

AREA 15 85 20 *This command changes the plotting area. It sets a central point at 15N 85W, and an aperture of 20 degrees from north to south.*

21c. 700 hPa streamlines and thickness.

WIN1 *The command WIN1 indicates that anything we type next will be displayed in window 1.*

STOF *Statistical values are not displayed.*

STRM WIND 700/THCK CIN7 DOTS F12
This command plots 700 hPa streamlines and thickness.

21d. 850 hPa streamlines and thickness.

WIN2 *The command WIN2 indicates that the next command will be displayed in panel 2.*

STRM WIND 850/THCK CIN7 DOTS F12
This command plots 850 hPa streamlines and thickness.

21e. 1000 hPa streamlines and thickness.

WIN3 *The command WIN3 indicates that the next command will be displayed in panel 3.*

STRM WIND 1000/THCK CIN7 DOTS F12
This command plots 1000 hPa streamlines and thickness.

21f. Boundary-layer streamlines and thickness.

WIN4 *The command WIN4 indicates that the next command will be displayed in panel 4.*

STRM WIND B015/THCK CIN7 DOTS F12
This command plots boundary-layer streamlines and thickness.

NOTE: the position of the confluent asymptote in the different levels. It can be noted that the asymptote is further north at mid-levels than at low-levels.

22. Moisture focus along a front and a shear line.

22a. First please go back to the 1 panel mode.

1PNL	*The command 1PNL returns to the 1-panel display.*

NOTE: Every time the display mode is switched the area must be redefined.

22b. Refresh ploting area:

AREA 15 78 20	*This command sets the display area to a central point at 15N 78W, and a north-south aperture of 20 degrees.*

22c. Lets evaluate saturation a different levels for a given time.

RELH CI10 1000 F12	*RELH plots relative humidity.This sequence of commands plots relative humidity for 1000 hPa at time F12 and at a contour iof 10%.*
RELH CI10 850 F12	*Similarly for 850 hPa.*
RELH CI10 700 F12	*Similarly for 700 hPa.*

- Which level is closer to saturation?
- What can we interpret from this and the distribution of clouds in the atmosphere?

But this provides a perspective of the distribution of moisture in the horizontal plane (or in two dimensions) only. It is important to uinderstand the distribution of moisture in the vertical.

23. Relative humidity between the surface and 500 hPa.

HUMD.	*Macro HUMD. Displays column moisture between 1000 and 500 hPa. Color Green shows values that are higher than 60%. Reds show 50% or less.*

- Why are values greater than 60% highlighted?
- What are condensation nucleii?
- What is the moisture tendency over the Bahamas/Cuba?
- What can be causing this?
- What is the tendency in the Southern Caribbean?

Please stop the animation at hour F12.

24. Overlaying fronts and shear lines.

THCK CIN7 DOTS CLR1 F12/	*This overlays the previously defined 1000-850 hPa thickness in dotted light blue lines.*
STRM WIND 1000 CLR2/	*These commands overlay the 1000 hPa streamlines using yellow.*

- What is the distribution of relative humidity with respect to the front and the confluent asymptote?
- Where is the largest separation? Across the islands or inside the Caribbean?

25. Using color contours.

25a. Relative humidity in the column.

F12	*Before executing a macro, forecast hour must be set up.*
HUME.	*Similarly to "HUMD", the macro "HUME" generates averages of relative humidity between the 1000-500 hPa layers. It exploits Wingridds's ability to use colored contours. Lighter greens reflect higher relative humidity values whereas browns and reds denote dry air.*

25b. Overlaying fronts and shear lines.

THCK CIN7 DOTS CLR1/	*This command overlies the previously define 1000-850 hPa thickness using dotted light blue lines.*
STRM WIND 1000 CLR3/	*This overlays 1000 hPa streamlines in purple.*

As in the previous case, higher saturation in the Caribbean Basin occurs near the shear line.

26. Cross section of a front.

26a. Making the cross section.

XSCT 40 75 22 63	*This generates a cross section from 40N 75W (in the left of the screen) to 22N 63W (in the right of the screen).*

26b. Temperature animation.

TEMP CIN4/ANIM	*This command generates a temperature animation using a contour interval of 4 degrees.*

- At forecast time F24, at what side of the screen can you find the cold air?
- At that same time, where is the surface front?

Please stop the animation.

27c. Potential temperature animation.

THTA CIN4/ANIM *The animation reveals the cold air incursión at low levels, and how the cold air gets distributed aloft.*

- At forecast hour F24, where in the animation is the cold air?
- Where is the cold front?
- What can we tell by the tight temperature gradient aloft?
- Can you see the vertical structure of the front propagating across the Atlantic?
- By late cycle, how deep is the front and at which levels can it be best depicted?

Please stop the animation.

27d. Vertical relative humidity distribution.

THTA CIN4 CLR1/RELH CI10 CLR2/RELH CTFC CFCA/ANIM

This command shows the vertical distribution of relative humidity with respect to the front as it propagates.The command "CTFC" sets shaded contours instead of simple contours. The instruction "CFCA" is the name of the color table to use. This file is available in the folder "C:/WINGRIDDS/USER/" and can be modified.

- Where is the relative humidity higher, behind or ahead of the front?
- As the front passes, why does the region in the cold side remain somewhat moist instead of drying significantly?
- What can be inferred from this?

Please stop the animation.

28. Cross section across the basin.

28a. Select the following cross section.

XSCT 23 83 8 73 *This command genererates a cross section from 23N 83W (to the left of the screen) to 08N 73W (to the right of the screen).*

28b. Potential Temperature Evaluation.

THTA CIN4/ANIM *The animation shows the cold air incursion at low levels, and how does the cold air gets distributed aloft.*

- How well is the front defined inside the Caribbean basin?
- Are there temperature gradients in the horizontal?
- What does this tell us?

Please stop the animation.

29. Vertical distribution of moisture.

THTA CIN4 CLR1/RELH CI10 CLR2/RELH CTFC CFCA/ANIM

This shows the vertical distribution of moisture as the front propagates. The command CTFC sets the graphic mode to shaded contours. "CFCA" is the predetermined color table available at the "C:/WINGRIDDS/USER" folder.

- Where do we see the largest distribution of relative humidity in the vertical?
- What can be associate this with? The front or the shear line?

Please stop the animation.

30. Convective Instability Evaluation.

30a. Select the following cross section:

XSCT 40 80 15 70 *This generates a cross section from 40N 80W to 15N 70W.*

30b. Equivalent Potential Temperature Animation.

THTE CIN3/ANIM *This generates an animation of equivalent potential temperature every three degrees.*

At time F06:

- How does the equivalent potential temperature behave with height at 38N 80W?
- Is this convectively stable or unstable? Up to which level?
- What is the tendency of equivalent potential temperature with height at 19N 73W?
- It this convectively stable or unstable? Up to which level?
- Which is the tendency of equivalent potential temperature with height at 28N 76W?
- Is this convectively stable or unstable? Until which level?
- What do we see at 800 hPa?

At forecast time F30:

- What is the tendency of equivalent potential temperature with height at 38N 80W?
- Is this convectively stable or unstable? Up to what level?
- What is happening in the column at 19N 73W? Is it becoming more or less stable?
- At forecast times F54 and F78, what is happening with the column at 19N 73W? Is it becoming less or more stable?

Please stop the animation at time F15.

31. Vertical motion in the column.

31a. Overlaying Omegas.

VVEL DPOS F15/ *This command overlays omegas at F15. Positive values are plotted using dotted lines.*

At 20N 73W:

- What is the sign of the omega contours at this point?
- What type of vertical motion is expected under these circumstances?
- Up to which level are these expected?
- Would this be conducive for shallow or deep convection?

At 31N 77W:

- What is the sign of the omega contours at this point?
- What type of vertical motion is expected under these circumstances?
- Up to which level are these expected?
- Would this be conducive for shallow or deep convection?

At 34N 79W

- What is the sign of the omega contours at this point?
- What type of vertical motion is expected under these circumstances?
- Up to which level are these expected?
- What pattern is expected under these conditions?

31b. Overlaying Ageostrophic Circulations.

ACRC AROW F15/ *This command overlies ageostrophic circulations using arrows for forecast time F15.*

At 20N 73W:

- What motions can be observed?
- Up to what level?
- Is this conducive for shallow or deep convection?

At 31N 77W:

- That type of motion can it be observed?
- Up to what level?
- It this conducive to shallow or deep convection?

At 34N 79W:

- That type of motion can it be observed?
- Up to what level?
- What pattern to we see under these conditions?

32. Time sections: analyzing temporal evolution.

32a. Select the location for the time section.

TSCT 20 71 *This generates a time section at location 20N 71W.*

32b. Plotting temperature.

TEMP CIN2 *This plots temperature at an interval of 2C.*

- What happens to temperature with time?
- What does this tell us?

32c. Dewpoint temperature.

DWPT CIN2 *This command plots dewpoint temperature with an interval of 2C.*

- What happens to temperature with time?
- What does this tell us?

32d. Equivalent potential temperature.

THTE CIN3 *This plots equivalent potential temperature at an interval of 3K.*

- At forecast hour F06, is the column convectively stable or unstable?
- Up to which level?
- What is the tendency of the equivalent potential temperature with time?
- What does this tell us?
- At which level can we see the inversion at F12?
- At which level can we see the inversion at F60?

32e. Overlaying Omegas.

VVEL DPOS/ *With this command we can overlay omega over equivalent potential temperature, with negative values using solid contours.*

- At forecast hour F06, what is the sign of omega?
- What type of motion is expected?
- Up to which level is this expected?

- At forecast hour F30, what is the sign of omega?
- What type of motion is expected?
- Up to which level is this expected?

- At forecast hour F60, what is the sign of omega?
- What type of motion is expected?
- Up to which level is this expected?

- At forecast hour F72/78, what is the sign of omega?
- What type of motion is expected?
- Up to which level is this expected?

- After 18 hrs and at the 600 hPa level,what is the prevailingt sign of omega?
- What type of motion is expected?
- What impact in the atmosphere should be expected under these conditions?

33. Evaluation of satellite imagery and event verification:

Verificacion_Ejercicio 1_Frente y Srln_Mar3-6-2009.ppt