Lab: case 25 November 2009

Insert flash drive in USB port
Check letter of the flash drive: <L>
Open McVCast

1. Set local ADDE servers

- McIDAS-V window, Tools **<Manage ADDE datasets>**
- Select **<Local Data**
- Select **<Metop>** Dataset
- Click **<Edit Dataset>**
- Directory: Browse to <L>:\Labs\20091125_convection
- Click **<Open>**
- Click **<Save Changes>**
- Select **<MSG>** Dataset
- Click **<Edit Dataset>**
- Directory: Browse to <L>:\Labs\20091125_convection
- Click **<Open>**
- Click **<Save Changes>**
- **Click <Ok>**

As we will look at a daytime case, we will also set up a local ADDE server for SEVIRI HRV (High Resolution Visible channel) and for Terra MODIS (to look at very high resolution MODIS visible images)

- Select **<MSGHRV>** Dataset
- Click **<Edit Dataset>**
- Directory: Browse to <L>:\Labs\20091125_convection
- Click **<Open>**
- Click **<Save Changes>**
- **Click <Ok>**
- Select **<TERRA>** Dataset
- Click **<Edit Dataset>**
- Directory: Browse to <L>:\Labs\modis (the MODIS data must be in a separate folder!)
- Click **<Open>**
- Click **<Save Changes>**
- **Click <Ok>**

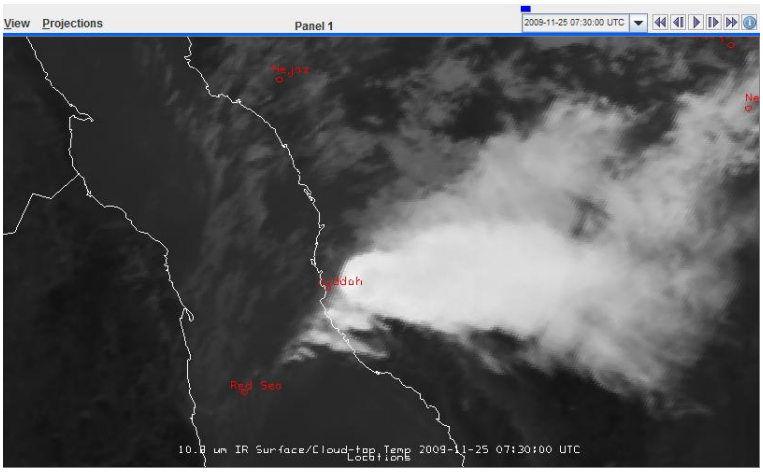
2. Open MSG SEVIRI IR10.8 image (SEVIRI channel 9)

- McIDAS-V Data Explorer window, **<Data Sources>** tag
- Satellite Imagery should be highlighted
- Server: select **<Local Data>**
- Dataset: select **<MSG>**
- Click **<Connect>**, wait

- Image Type: select **<SEVIRI>**
- Times: select **<Absolute>**
- Select the 07:30 UTC image from the list
- Click: **<Add Source>**
- Fields window: select **<10.8 um IR>, <Temperature>**, wait
- Displays window: select **<Advanced>** tag
- Put **<Magnification>** slider to maximum (1)
- Select **<Region>** tag
- Select region around Jeddah (not too big) by pressing shift key and dragging the area with the left mouse button
- Click **<Create Display>**, wait

Check the result: look at the IR image in the McIDAS-V window
The inverted IR image should be displayed. Change the range to 185 K (white) to 320 K (black).

- Zoom in on Jeddah (right mouse key to drag, scroll mouse to zoom in)
- To see where Jeddah is go to the McIDAS-V window, **<Display>, <Plot Location Labels>, <World>, <Middle East>.** The image should look like this:



There is a convective storm close to Jeddah. Question: What type of storm is it? Cold U-shape storm? Cold ring-shape storm? Looking at the form of the clouds (see also the clouds over the Red Sea), what is the wind situation at high levels? What is the wind at low levels? What is the synoptic situation of this case?

If you want, you may switch from the black/white colour table to the Setvak colour table (right mouse click on colour bar, Edit Colour Table …).

- Save the image
- McIDAS-V window, **<View>, <Capture>, <Image>**
- On Flash drive <L> with Filename: 20091125_0730_msg_ir108.png
- Click: <Save>

3. Find the minimum Brightness Temperature (BT)

- Zoom strongly on the cold storm over Jeddah
- Click and keep pressed middle mouse button
- The lat/lon and BT information appears on the bottom of the display window
- Move mouse cursor across the image and find the coldest pixel of the SEVIRI (on the left side of the storm).

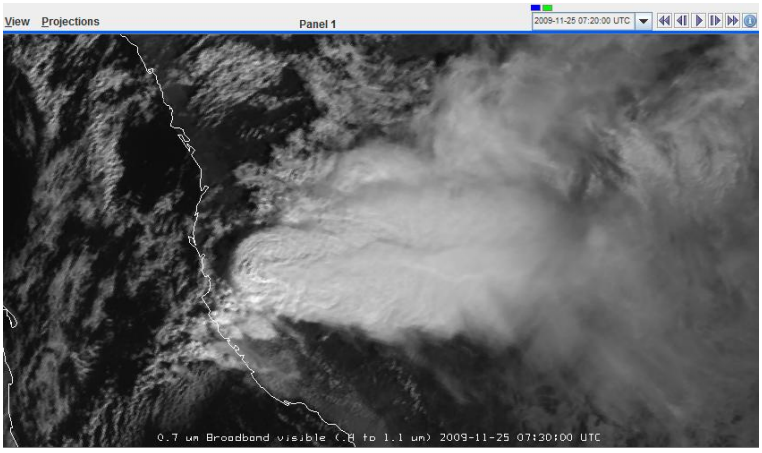
Question: Conceptually, what feature is this cold blob on the west side of the storm?

- Move mouse cursor across the image and find the warmest pixel of the SEVIRI in the warm embedded area

Question: How large is the difference between the coldest pixel and the warmest inside the warm embedded area? Compare this to the value for the UAE storm (9 Aug 2008).

4. Open MSG SEVIRI HRV image (SEVIRI channel 12)

- McIDAS-V Data Explorer window, <**Data Sources**> tag
- Satellite Imagery should be highlighted
- Server: select <**Local Data**>
- Dataset: select <**MSGHRV**>
- Click <**Connect**>, wait
- Image Type: select <**SEVIRI HRV**>
- Times: select <**Absolute**>
- Select 07:30 UTC from the list
- Click: <**Add Source**>
- Fields window: select <**0.7 um Broadband**>, <**Reflectivity**>, wait
- Displays window: select <**Advanced**> tag
- Put <**Magnification**> slider to maximum (1)
- Select <**Region**> tag
- Select region around Jeddah (not too big) by pressing shift key and dragging the area with the left mouse button
- Click <**Create Display**>, wait
- The resulting image should look like this:

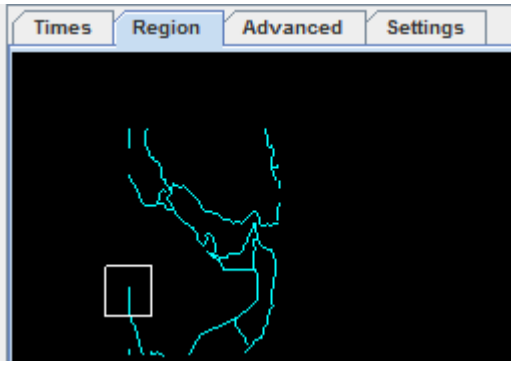


Check the result: the HRV image should be displayed on top. Toggle the HRV and the IR images to compare the horizontal resolution of the images. Question: What extra features do you see in the HRV image that you cannot see in the IR image?

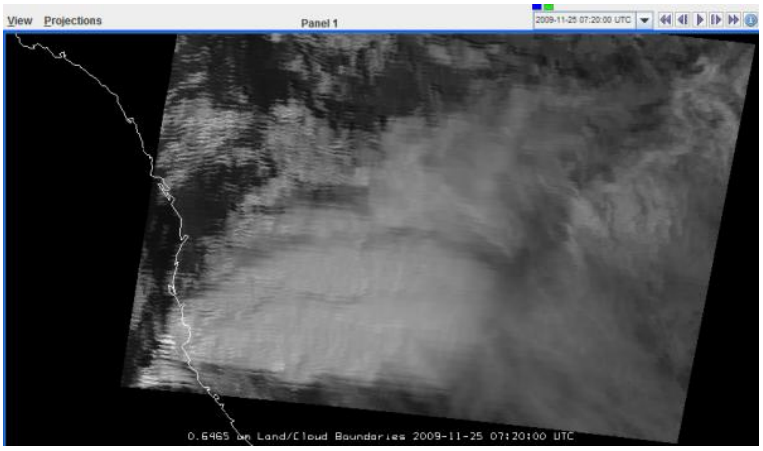
- Save the HRV image
- In the Legend: make sure that only the SEVIRI HRV image is selected
- McIDAS-V window, <View>, <Capture>, <Image>
- On Flash drive <L> with Filename: 20091125_0730_msg_hrv.png
- Click: <Save>

5. Open Terra MODIS 0.6 um image (MODIS Band 1)

- McIDAS-V Data Explorer window, **<Data Sources>** tag
- Satellite Imagery should be highlighted
- Server: select **<Local Data>**
- Dataset: select **<TERRA>**
- Click **<Connect>**, wait
- Image Type: select **<MODIS>**
- Times: select **<Absolute>**, you will see one image (07:20 UTC) in the list
- Click: **<Add Source>**
- Fields window: select **<0.6465 um>**, **<Reflectance>**, wait
- Displays window: select **<Advanced>** tag
- Put **<Magnification>** slider to maximum (1)
- Select **<Region>** tag
- Select region around Jeddah (on the very left of the preview image, see example below) by pressing shift key and dragging the area with the left mouse button

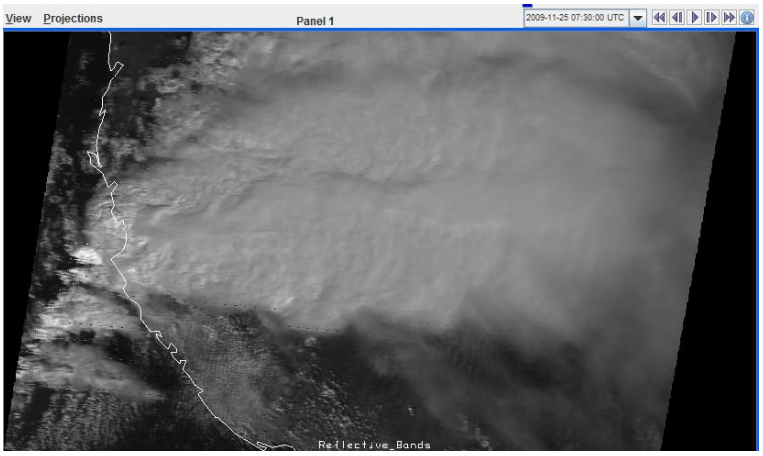


- Click **<Create Display>**, wait
- The resulting image should look like this:



Question: Why is the MODIS image so "noisy", or better so "stripy"? Consider the position of the image as regards the satellite path.

- As the image is more or less useless, remove the image layer
- The trick is to display through the HYDRA chooser rather than "Imagery" chooser
- In the McIDAS-V Data Explorer window, select **<HYDRA>**
- At the **<Field Selector>** stage select **<MultiSpectral>, <Refelctive_Bands>**
- At the **<Displays>** stage select **<MultiSpectral Display>**
- In the **<Channels>** tag select Band 1
- In the **<Region>** tag shift-click and drag on the preview image the region around the convective storm (or you won't get a full resolution image)
- Click **<Create Display>**
- If it does not work (error message), try again!
- The resulting image should look like this:

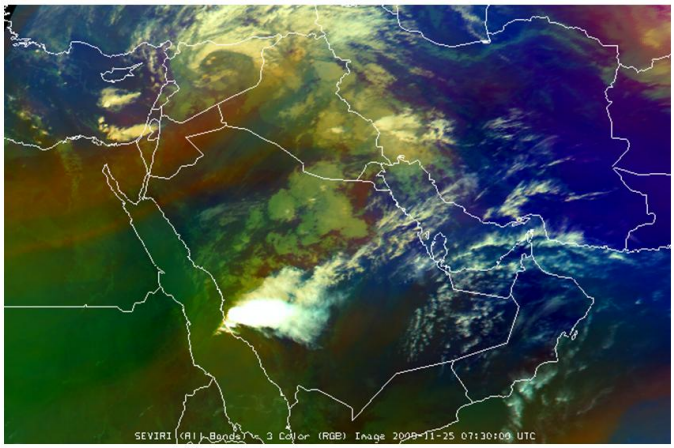


Toggle the MODIS Band 1 image and the SEVIRI HRV image. Question: Which image has higher resolution? Why is the storm in the MODIS image further to the west? Try to enhance the above-anvil plume as much as possible (change the colour scale).

6. Analyze synoptic situation with the help of the airmass RGB

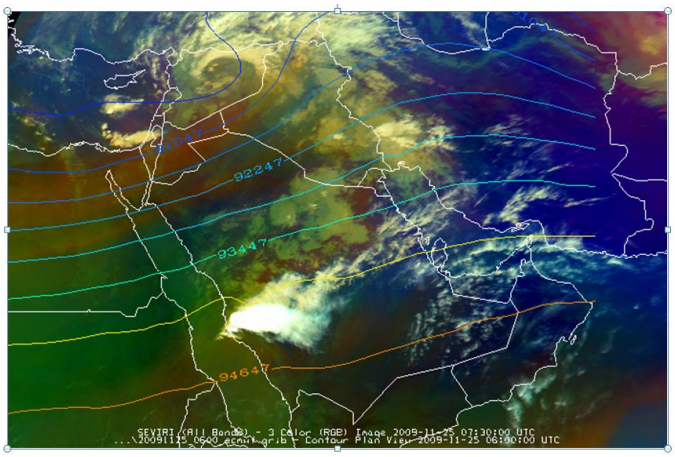
- McIDAS-V Data Explorer window, **<Field Selector>** tag
- In **<Data Sources>** window select **<SEVIRI (All Bands)>**
- In Fields window, select **<SEVIRI RGB>** **<AIRM (air mass)>**, wait
- Displays window: select **<Advanced>** tag
- Put **<Magnification>** slider to maximum (1)
- Select **<Region>** tag
- Select bigger area that includes the area from Turkey to Oman by pressing shift key and dragging the area with the left mouse button
- Click **<Create Display>**, wait
- Go to the McIDAS-V window to see the result (zoom out)
- Now you have 3 images open, the airmass RGB should be the top image (see image below)

Now that you see the airmass RGB: what is the synoptic situation? Where is the main vorticity centre? Where is the jet?



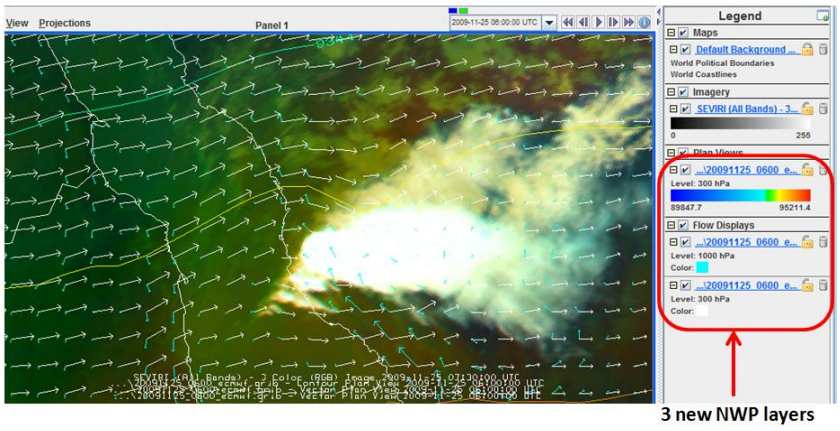
7. Display ECMWF model wind fields

- Let's open the ECMWF 6 UTC analysis for this case (GRIB data)
- McIDAS-V window, **<File>** **<Open File>**
- Browse to <L>:\Labs\ecmwf
- Change **<Files of Type>** **to** **<All Files>**
- Select 20091125_0600_ecmwf.grib
- Click **<Open>, wait**
- Go to McIDAS-V Data Explorer window
- Select the **<Field Selector>** tag
- Select **<3D grid>, <Geopotential>**, wait
- In the Displays window select Level, 300 hPa
- Click: **<Create Display>, wait**



You should see the 300 hPa geopotential field (coloured lines, as shown above). Let us add the wind fields at 300 and 1000 hPa.

- Go to McIDAS-V Data Explorer window
- Select the **<Field Selector>** tag
- Select **<3D grid>, <Derived>, <Geostrophic Wind Vectors>**
- In the Displays window make sure that Vector Plan View is selected
- In the Level tag select 300 hPa
- Click: **<Create Display>, wait**
- Go to McIDAS-V Data Explorer window
- Select the **<Field Selector>** tag
- Select **<3D grid>, <Derived>, <Geostrophic Wind Vectors>**
- In the Displays window make sure that Vector Plan View is selected
- In the Level tag select 1000 hPa
- Click: **<Create Display>, wait**
- To make the wind vectors larger, left click the name of the displayed field to get the Layer Controls
- Change the **<Size>** of the vectors to 8 or 10
- The result should look like this (zoomed on Jeddah):



Check the result: the 300 hPa and 1000 hPa winds should be displayed with different colours. Is there a wind shear between 1000 and 300 hPa?

- Save the image with wind fields
- McIDAS-V window, **<View>, <Capture>, <Image>**
- On Flash drive <L> with Filename: 20091125_0730_msg_rgb_airmass_winds.png
- Click: <Save>

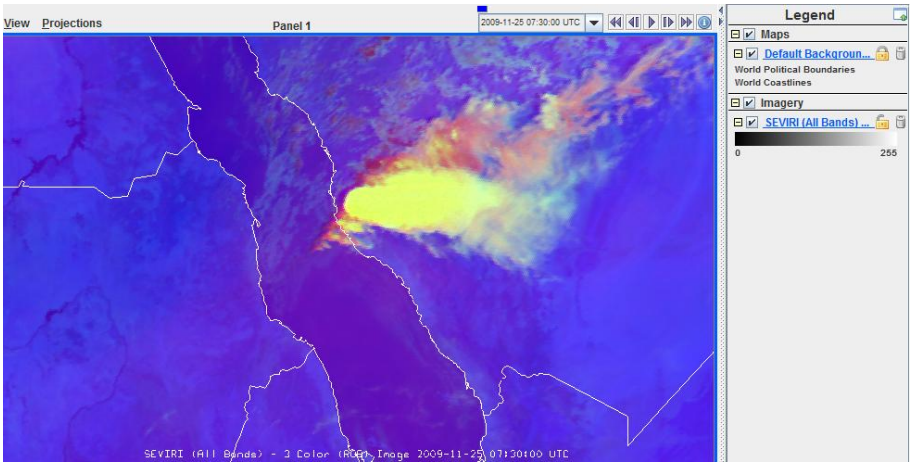
8. Create Convection RGB tuned for this case

To free memory, close and re-open McVCast

- McIDAS-V Data Explorer window, **<Data Sources>** tag
- Satellite Imagery should be highlighted
- Server: select **<Local Data>**
- Dataset: select **<MSG>**
- Click **<Connect>**, wait
- Image Type: select **<SEVIRI>**
- Times: select **<Absolute>**, you will see one image (07:30 UTC) in the list
- Click: **<Add Source>**

Load standard convection RGB

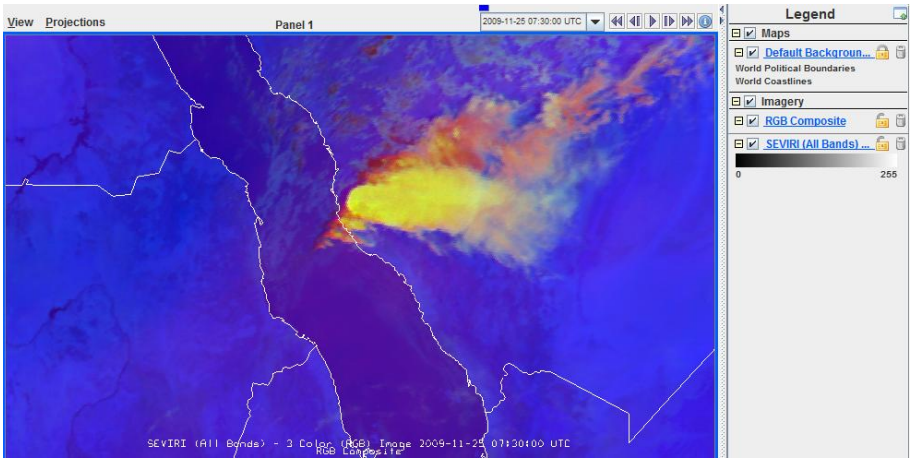
- McIDAS-V Data Explorer window, **<Field Selector>** tag
- In Field Selector window, select **<SEVIRI RGB> <SCON (severe convection)>**, wait
- Displays window: select **<Advanced>** tag
- Put **<Magnification>** slider to maximum (1)
- Select **<Region>** tag
- Select large region around Jeddah by pressing shift key and dragging the area with the left mouse button
- Click **<Create Display>**, wait, the image should look like this:



The convective storm is completely yellow (over enhanced, no contrast). What does the yellow colour stand for? What can we do to improve this RGB image?

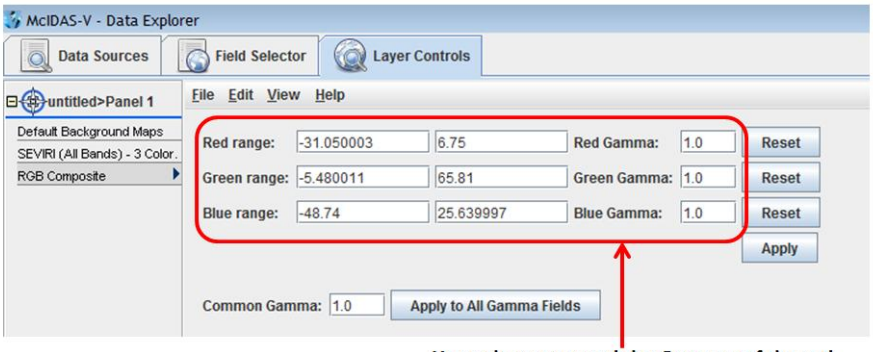
- McIDAS-V Data Explorer window, **<Field Selector>** tag
- In Field Selector window, select **<SEVIRI RGB> <GCON (generic SCON)>**, wait
- Displays window: select **<Advanced>** tag

- Check that **<Magnification>** slider is still at maximum (1)
- Select **<Region>** tag
- Check that the same region is selected as before
- Click **<Create Display>**, wait



A new convection RGB image appears on top, with different colours. Toggle the 2 images. Which one is "better"?

The generic Convection RGB has different ranges for the colour beams. You can modify / tune the ranges in the <Layer Controls> window. The most important component of this RGB is the green component (IR3.9 – IR10.8 difference).



Here, the ranges and the Gammas of the red, green and blue components are defined !

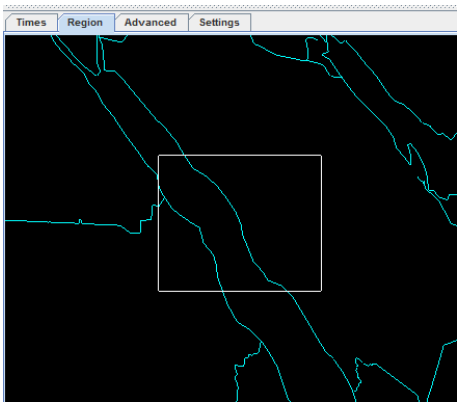
You have to hit "ENTER" on the keyboard to make changes effective !

- Change the Green range to test the ranges [-5, 50], [-5, 60], [0, 70] and see what happens. You have to press **ENTER** on the keyboard to make changes happen.
- Test the effect of the Green Gamma: set it to 0.5, 1.0, 1.5, 2.0 and see what happens.

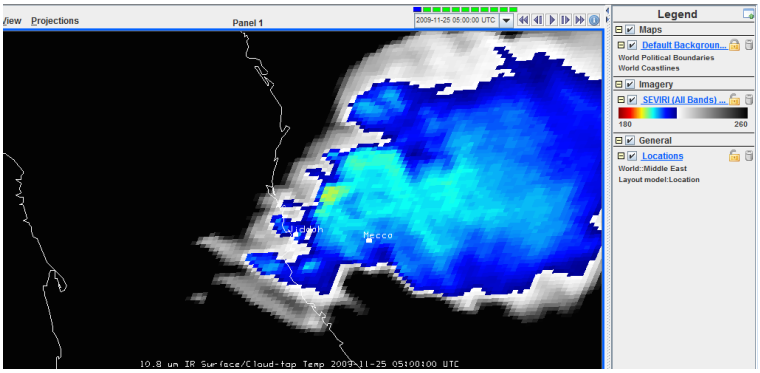
- Save the image
- McIDAS-V window, <View>, <Capture>, <Image>
- On Flash drive <L> with Filename: 20091125_0730_msg_rgb_convection.png
- Click: <Save>

9. Analyse storm development / cloud top features in animation

- Close McV and re-open McV
- McIDAS-V Data Explorer window, **<Data Sources>** tag
- Server: select **<Local Data>**
- Dataset: select **<MSG>**
- Click **<Connect>**, wait
- Image Type: select **<SEVIRI>**
- Times: select **<Absolute>**
- Select the 05:00 to 07:30 UTC images
- Click: **<Add Source>**
- Fields window: select **<10.8 Temperature>**, wait
- Displays window: select **<Advanced>** tag
- Put **<Magnification>** slider to maximum (1)
- Select **<Region>** tag
- Select a small region around Jeddah (see example below) by pressing shift key and dragging the area with the left mouse button



- Click **<Create Display>**, wait
- To see where Jeddah is go to the McIDAS-V window, **<Display>, <Plot Location Labels>, <World>, <Middle East>**
- Right mouse click on colour bar of the SEVIRI image, select **<Edit Colour Table>**
- A new window (Colour Table Editor) will pop up
- Click on **<Colour Table>** menu and select **<System>, <Legacy>, <Setvak>**
- Change the **<Range>** to 180 K to 260 K
- Click **<Apply>,** Click **<Ok>**, the image should look like the example below
- Run the animation



Question:

- Save the loop
- McIDAS-V window, **<View>, <Capture>, <Movie>**
- Tick "Save Files to" and Select destination directory (on <L> flash drive)
- In the "Filename Template" put "%time%_m9_ir108_col.png" (you must specify the extension!)
- "Image Quality" should be set to High (default)
- Click on **<Time Animation>**, this starts the capturing process!
- Wait until all images are captured (when the loop is finished)
- Do not save the QuickTime movie (click "Cancel")
- "Close" the Movie Capture window
- Check if the images have been saved correctly!!

Read more about this case on the web: Severe convection along the Red Sea coast