**LAB: Introduction to McIDAS-V (McV)**

This lab shows some of the basic functionalities of McV, including opening files, displaying different channels, changing projection, etc. At the same time, we will briefly analyze a convective cloud system over South Africa / Botswana with Meteosat -8 (MSG) SEVIRI and Meteosat-5 MVIRI data.

In McV you have different ways of opening satellite data, like local or remote ADDE servers, so-called bundles or simply opening a file with Hydra (Hydra is integral part of McV). In this lab, we will open the data by using local ADDE servers, just like you would do on a Eumetcast receiving station (where the MSG data is locally available in HRIT format).

There are 2 portable McV versions on the USB stick: versions 1.4 and 1.5. We will mostly use the very old 1.4 version (which is faster); however, version 1.5 is needed for displaying Himawari AHI data (in the Dust RGB tuning lab).

The actual, official version of McV is currently version 1.6 that you can download from the McV web page and install on your computer. With version 1.6 you can display GOES-16 ABI data. Note that, for the portable McV versions, no installation is required (thus portable, Java runtime environment is included) and a number of settings (preferences) are already set to optimize the display of SEVIRI, MODIS etc. data. You can simply stick the flash drive into any Windows computer and immediately start a McV session.

Note: if you want to explore all the power of McV, you should study the McV guide that you can find in the **McIDAS-V Guide** folder.

Here are step-by-step instructions for this lab (key questions are in yellow):

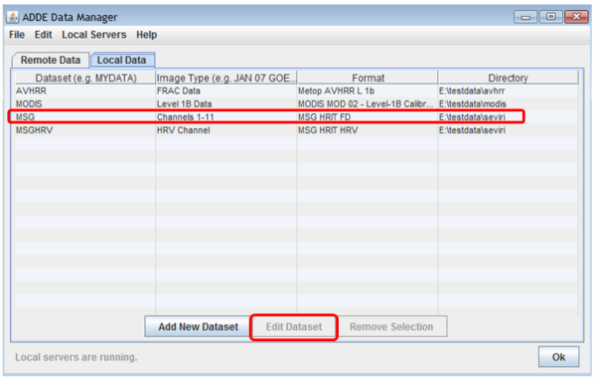
1. Start McIDAS-V
   a. Insert flash drive in USB port
   b. Check letter of the flash drive: **(L:)**
   c. Open McIDAS-V by double-clicking on the **runMcV.bat – Shortcut** icon in the main folder of the flash drive. For info: the shortcut refers to **runMcV.bat** file in the **McIDAS-V-System** directory.

The opening of McV may take more than one minute (depends on PC power). Two windows will open: the **McIDAS-V** map window (display window) and the **Data Explorer** window (data and channel selection window).

2. Set local ADDE servers (**if the Letter of your local flash drive is E you can skip this section**)

   a. In the **McIDAS-V** map window, select **Tools → Manage ADDE datasets**


   b. Select the **Local Data tab**
   c. Select the **MSG** Dataset
   d. Click **Edit Dataset**

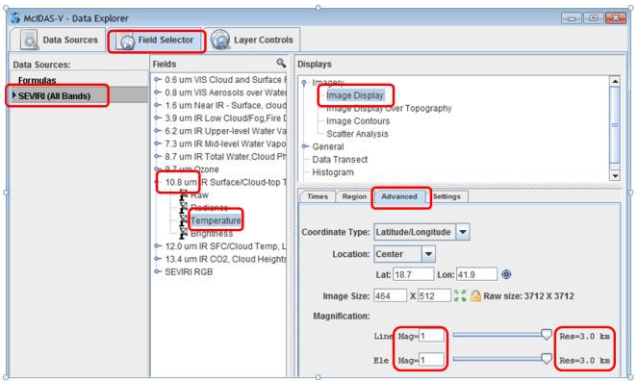



e. Note: the format for displaying MSG HRIT data (channels 1-11) is "MSG HRIT FD" (already selected, do not change)!
f. Directory: browse to **L:\Data\seviri** (navigate to the according directory on your flash drive)
g. Click **Open**
h. Click **Save Changes**
i. Do the same for all other datasets:

| **Dataset** | **Directory** |
|---|---|
| AVHRR | avhrr |
| IODC | mviri |
| MET7 | met7_area |
| MISA | seviri2 |
| MISAHRV | seviri2 |
| MODIS | modis |
| MSGHRV | seviri |

j. Click **OK** when you are done.

3. Open MSG SEVIRI IR10.8 image (SEVIRI channel 9)
   a. In the **Data Explorer** window, select the **Data Sources** tab
   b. Select **Imagery** under **Satellite** in the panel on the left side
   c. Select **Server**: <LOCAL-DATA>
   d. Select the **Dataset**: MSG
   e. Click **Connect** and wait
   f. Select the **Image Type**: Channels 1-11
   g. Go to the **Absolute** tab and select the image at **2005-11-06 14:00:00 UTC**
   h. Click **Add Source**
   i. In the **Field selector** tab, select **Channels 1-11** in the **Data Sources** panel and then **10.8 um IR Surface/Cloud-top Temp → Temperature** under the **Fields** panel and wait (Note: for IR images, we always select **Temperature**. **Raw** is to display the original counts (0 to 1023) and **Radiances** would display the radiance data (converting the counts with calibration info to radiances).
   j. Select **Imagery → Image Display** in the **Displays** panel
   k. Select the **Advanced** tab and put the **Magnification** slider to the maximum (1)



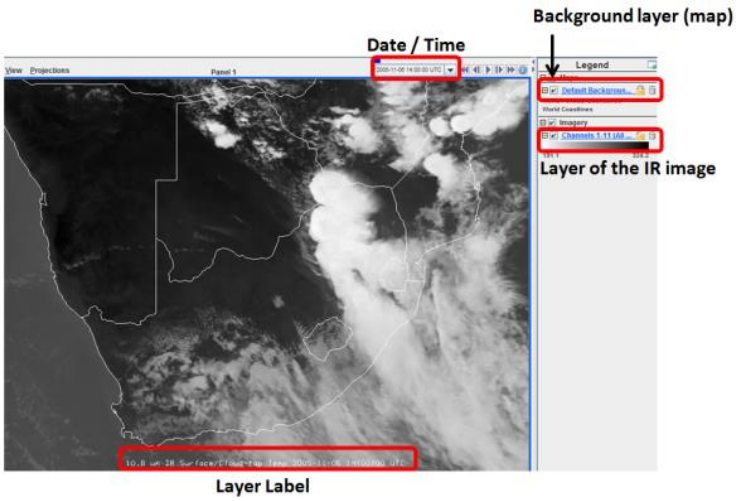

l. Go to the **Region** tab and select a large area that includes South Africa, Namibia and the South Atlantic. You can do this by holding down the **Shift key** and dragging the area with the **left mouse button.** You can also zoom in by using the **mouse wheel.**

m. Click **Create Display**, wait

n. Change the range of the displayed IR image: **right-click** the colour bar and select **Change Range.** Change the range from **190** to **300** K and click **OK.**

o. Zoom in on South Africa (**right mouse button** to drag, **mouse wheel** to zoom in)

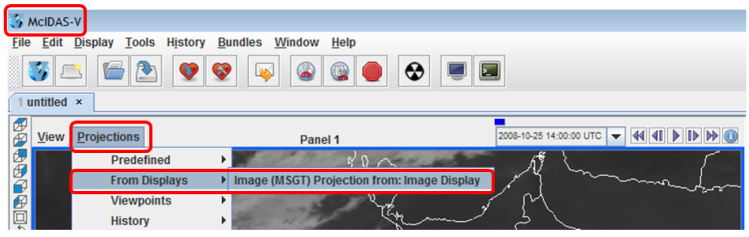
p. Check the result: look at the IR image in the McIDAS-V window. The inverted IR image should be displayed as in the image below. Check the info given in the McIDAS-V window.




q. Tick on and off the background layer to switch the map on and off

4. Change the projection and enhance the IR image

a. The current projection is the simple equidistant Lat/Lon projection (Plate Carrée), which is the best choice if you want to export the images to Google Earth. Change the projection of the image to the original (MSG) satellite projection by selecting **Projections → From Displays → Image (MSGT) Projection from: Image Display**



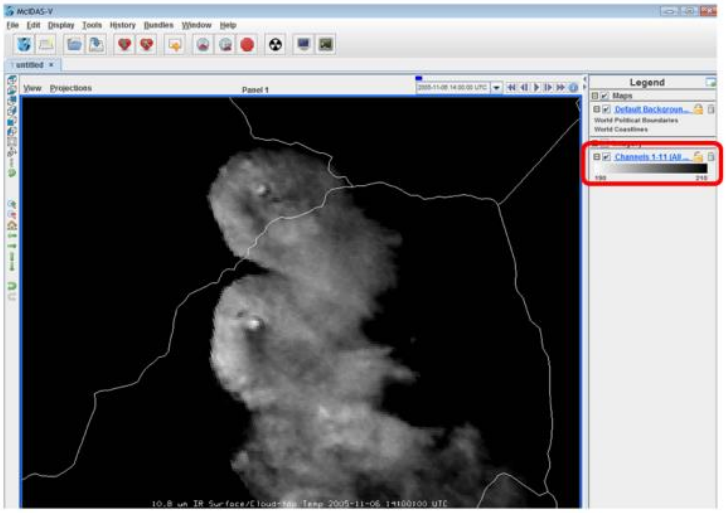

b. Now the IR image should be a rectangular image (as defined by the lines and columns of the original MSG image).

c. Change the projection to Mercator by selecting **Projections → Predefined → Mercator**

d. As the image zooms out automatically, strongly zoom in on the convective clouds over South Africa

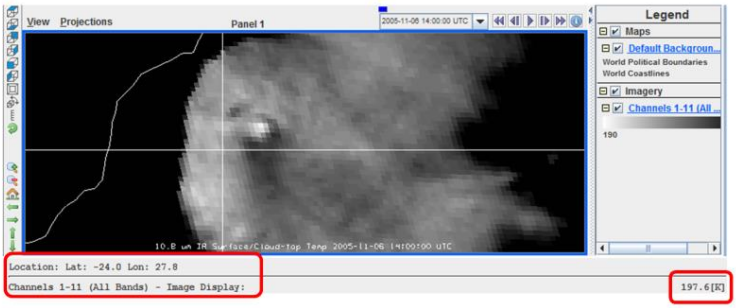
e. Now, **change the range** of the displayed IR image to **190** to **210** K, to only see the coldest clouds.

The image should look like this:



f. Now, find the coldest IR pixel in the image: hold down the **middle mouse button** (the wheel).

g. A white cross appears at the cursor position, and the lat/lon and BT information appears on the bottom of the display window, as in the image below. Note that in order to see the readings, the window should not be full screen.

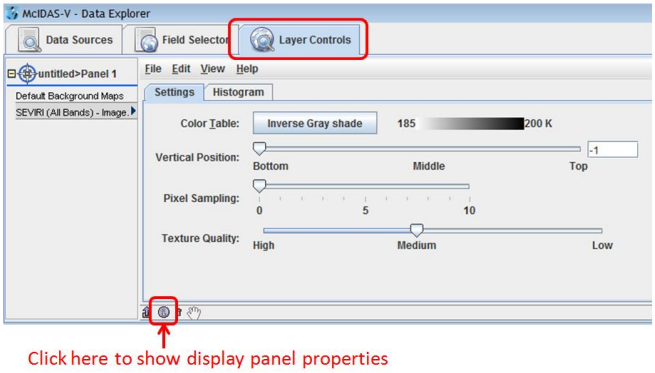



h. Move the cursor across the image and find the coldest pixel of the SEVIRI IR image. Note the value. Is it below 190 K?

i. Let us put a colour bar on the IR image

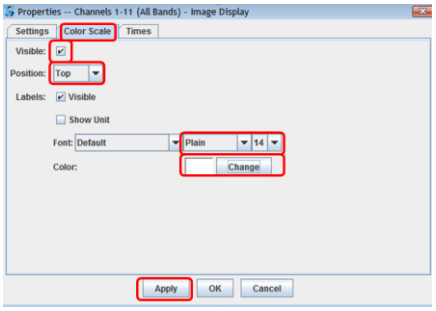
j. **Left-click** on the **layer name (Channels 1-11 (All Bands))** in the Legend panel.

k. The **Layer Controls** tab in the **Data Explorer** window pops up. See the image below:



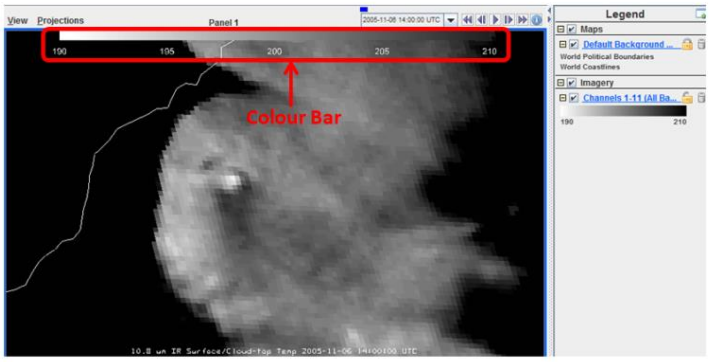

l. Click on the info button, as indicated in the image

m. A new window with different tabs will pop up as shown below




n. In the **Colour Scale** tab make the colour table visible and change the font as indicated above

o. Click **Apply** and when you like the result click **OK.** The image should look like this (with the colour bar on top):

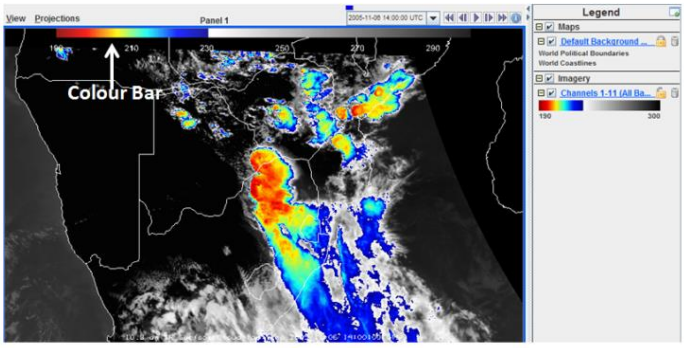



p. Now let us change the range back to **190** to **300** K and create a colour enhancement of the IR image

q. **Right-click** the colour bar and select **Change Range.** Change the range from **190** to **300** K and click **OK.**

r. **Right-click** again the colour bar and select **System** → **Legacy** → **Setvak** (see Annex 1 for info about this colour table)

s. Zoom out to see South Africa and Botswana; the image should look like this:




t. Finally, save the image. To do so, go to the McIDAS-V window and navigate to **View** → **Capture** → **Image** (see the image below)


u. Save the image on your flash drive **L:** in the directory "Images" with filename: **20051106_1400_msg_ir108_col.png**
(please, you **must type .png** as the extension of the file to get PNG images!)

v. Click **Save**

Question: conceptually, what feature are the cold storms over northern South Africa and southern Botswana? Can you see any structures? And, what do you think (which synoptic situation) has caused these convective storms?

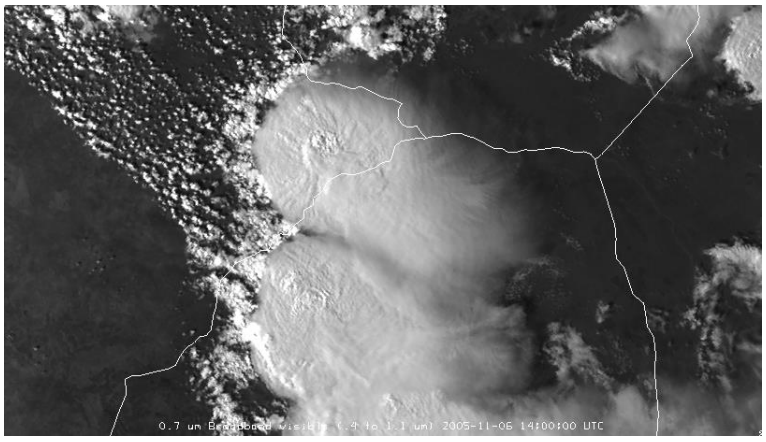
Note: To answer these questions, you may display the VIS0.8 and WV6.2 images. And, you could display the Airmass RGB (AIRM), Dust RGB (DUST) and the Severe Convection RGB (SCON). In the next Labs you will learn how to display RGB images.

5. Display the SEVIRI HRV Image and compare to IR10.8 image
   a. In the **Data Explorer** window, select the **Data Sources** tab
   b. Select **Imagery** under **Satellite** in the panel on the left side
   c. Select **Server**: <LOCAL-DATA>
   d. Select the **Dataset**: MSGHRV
   e. Click **Connect** and wait
   f. Select the **Image Type**: HRV Channel
   g. Go to the **Absolute** tab and select the image at **2005-11-06 14:00:00 UTC**
   h. Click **Add Source** and wait
   i. In the **Field selector** tab, select **0.7 um Broadband visible → Reflectivity** under the **Fields** panel and wait
   j. Select **Imagery → Image Display** in the **Displays** panel
   k. Select the **Advanced** tab and put the **Magnification** slider to the maximum
   l. Go to the **Region** tab and select a large area from Namibia to Madagascar
   m. Click **Create Display**, wait

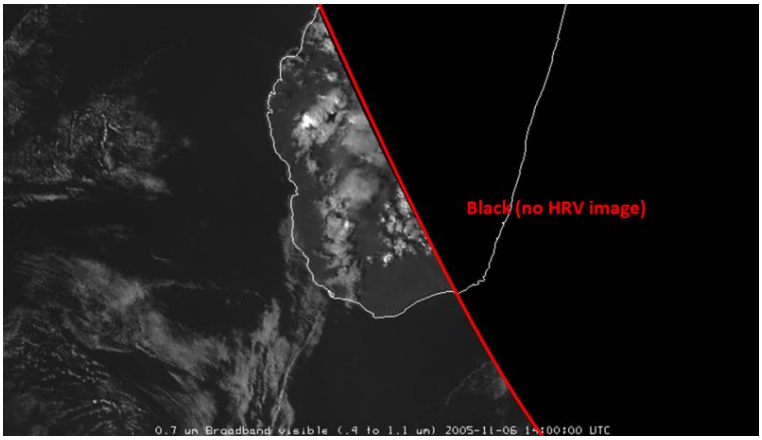
Check the result: the HRV image should be displayed on top, but it is relatively dark. Question: Why is it so dark?

   n. Change the range of the displayed HRV image: right-click on the colour bar → **Change Range**, from 0 to 60 (% reflectance). The image becomes much brighter!

Zoom on the convective storms and toggle the HRV and the IR images to compare the images. What extra features do you see in the HRV image that you cannot see in the IR image (see e.g. image below)?



   o. Now, zoom to Madagascar and you can see that the HRV image is cut off as shown in the image below. Why is the image black east of the red line (think of the time of the image 14 UTC)?

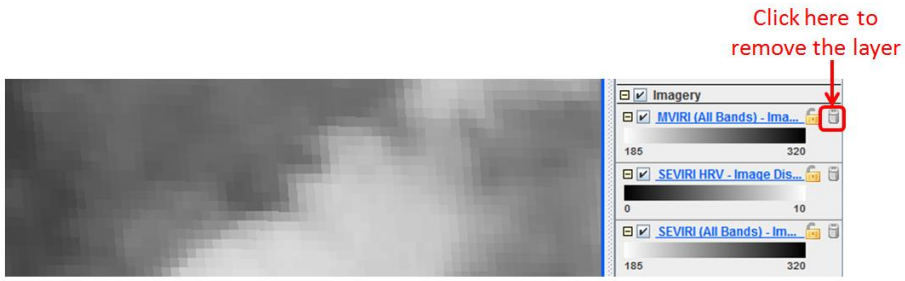



p. Save the HRV image: in the main window, navigate to **View → Capture → Image** and save the image
q. Click **Save**

6. Display Met-5 infrared image (for comparison)
   a. In the **Data Explorer** window, select the **Data Sources** tab
   b. Select **Imagery** under **Satellite** in the panel on the left side
   c. Select **Server**: <LOCAL-DATA>
   d. Select the **Dataset**: IODC
   e. Click **Connect** and wait
   f. Select the **Image Type**: MVIRI
   g. Go to the **Absolute** tab and select the image at **2005-11-06 14:30:00 UTC**
   h. Click **Add Source** and wait
   i. In the **Field selector** tab, select **11.5 um IR Surface/Cloud-top Temp → Temperature** under the **Fields** panel and wait
   j. Select **Imagery → Image Display** in the **Displays** panel
   k. Select the **Advanced** tab and put the **Magnification** slider to the maximum
   l. Go to the **Region** tab and select the region that includes South Africa and Madagascar
   m. Click **Create Display**, wait
   n. Go to the McIDAS-V window to see the result
   o. **Change the range** of both IR images (Met-5 MVIRI and Met-8 SEVIRI) to **190** to **300** K and use the **Setvak** colour table for both images.

Zoom on the convective storms over northern South Africa. Toggle the Met-5 (MVIRI) and the Met-8 (SEVIRI) IR images. As you can see, the (cold) clouds are not in the same position. Question: why? Compare the IR brightness temperatures of the two IR images. Hold down the mouse wheel and read the values. Are they the same?

p. Now, remove the Met-5 MVIRI IR image by clicking on the remove button as indicated below

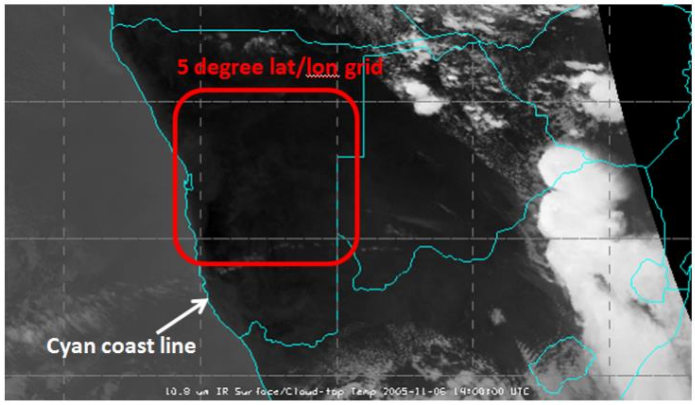



q. And last but not least, change the background map a bit
r. Click on the text of the **Default Background Maps** label

s. That will open the **Layer Controls** tab in the **Data Explorer** window

t. In the **Maps** tab, tick off **World Coastlines** and **World Country Outlines** and tick only the **World Country Outlines** on the bottom of the list and select cyan as colour. This map database has also some islands included!

u. In the **Lat/lon** tab, create a lat/lon grid of **5** degrees interval (change the **Interval** for both Latitude and Longitude to 5). Press **Enter** in order to approve the changes. The result should look like this:



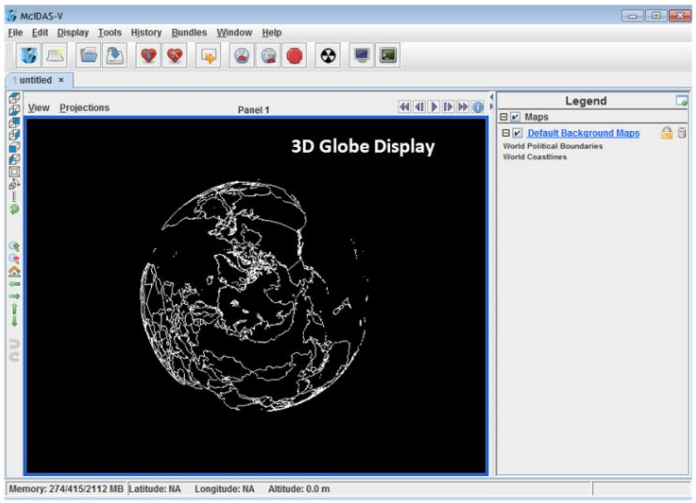

v. Save the IR image: in the main window, navigate to **View → Capture → Image** and save the image

w. Click **Save**

7. Display Met-5 and Met-8 infrared images on 3D Globe

a. In the McIDAS-V window, select **File → New Display Window → Globe Display → One Panel**

b. A new McIDAS-V window will appear, see example below

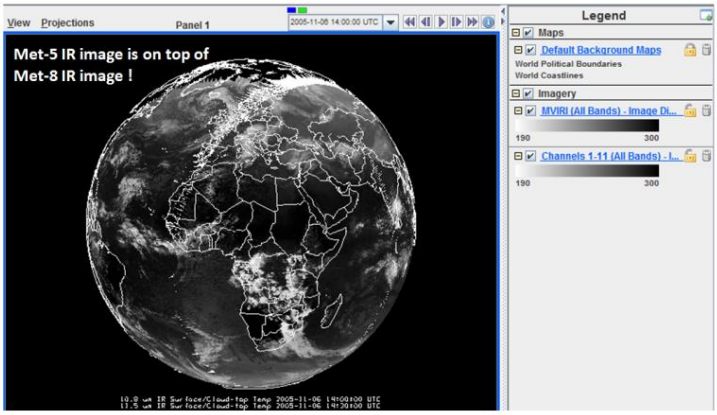



c. Go to the **Data Explorer** window and load the Met-8 (MSG) IR10.8 image for the same time at full resolution for the whole Met-8 disk (if you do not remember how to do that, see instructions above)

d. Rotate the Globe to see Africa (hold **Control key** and use **right mouse button**)

e. Set the range again to 190 to 300 K

f. Load the Met-5 IR image (full disk) and set the range also to 190 to 300 K. The display should look like this:




g. The Met-5 image is on top of the Met-8 image. You can change this order by: **right-click** on the label of the Met-8 image and select **View → Bring to Front**

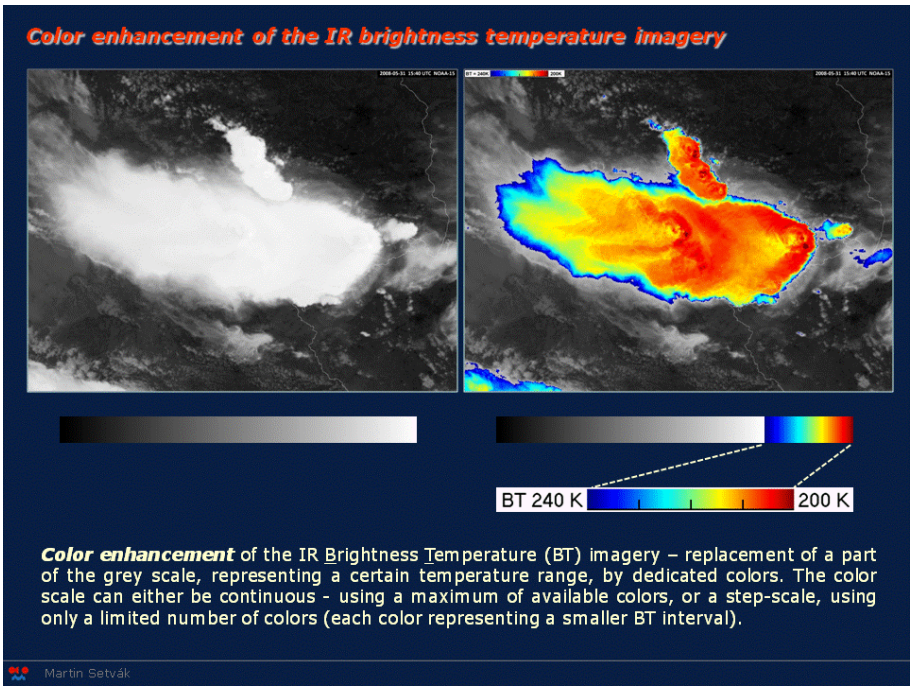
h. Rotate the Globe and zoom as you like. How far east does Met-5 cover? Is Beijing included in the image?

i. You can create an animated rotation of the Globe by holding the **Control key** and swiping the **right mouse button** across the image (like you do on tablet PCs with your finger)

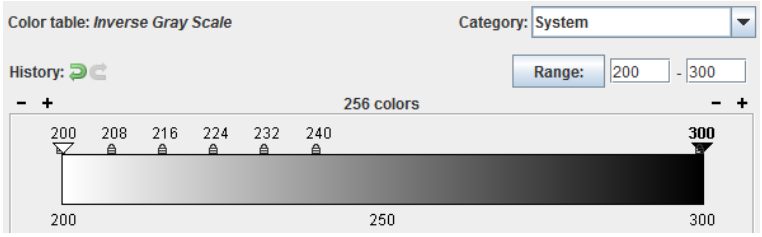
Read more about this case on the web:
Severe weather over South Africa and Botswana

## Annex 1: How to create the Setvak IR colour table

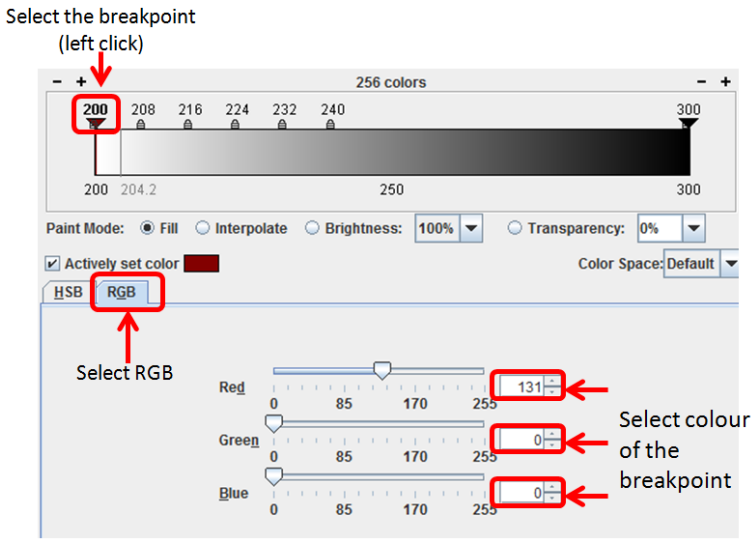
For info, check the Convection Working Group website.



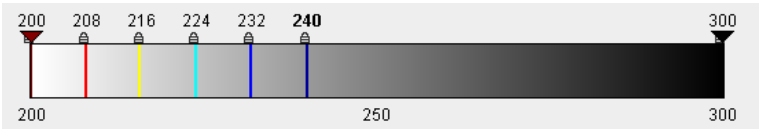

a. Open an IR image and set range from 200 to 300 K
b. Right-click on the colour bar of the IR image, select **Edit Colour Table**
c. A new window (**Colour Table Editor**) will pop up
d. Top Menu: select **Color Tables → System → Inverse Grey Scale**
**e.** Add 5 new breakpoints in the colour table by right-clicking on the colour bar **Add Breakpoint → At Data Point → Value = 208**, Click **OK**
f. Repeat this for breakpoints at **216**, **224**, **232** and **240** K.
g. Lock all breakpoints: right-click on the breakpoint → **Lock Breakpoint**. This is to prevent you from moving/changing the breakpoints. The **Colour Table Editor** should look like this:



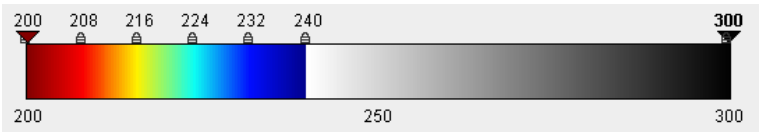

h. Then, select breakpoint **200** K (left-click)
i. Select the colour for this breakpoint by clicking on the **RGB** tab
j. Select Red=**131**, Green=**0**, Blue=**0** (dark red), see screenshot below:




k. Do the same for the breakpoint **208** K (**255,0,0**) red
l. Do the same for the breakpoint **216** K (**255,255,0**) yellow
m. Do the same for the breakpoint **224** K (**0,255,255**) cyan
n. Do the same for the breakpoint **232** K (**0,0,255**) blue
o. Do the same for the breakpoint **240** K (**0,0,131**) dark blue
p. You should now see some nicely coloured lines in the colour bar window (see below)




q. Now, to interpolate between these breakpoint colours, you have to:
   **i.** Right-click on the **208** K breakpoint, and select from the drop down list: **Edit Colours → Interpolate → Left**
   ii. Do the same for the **216** K, **224** K, **232** K and **240** K breakpoints
r. Now, let us also enhance the warm part of the colour table (240 to 300 K) by selecting the **240** K breakpoint again (left-click)
s. Change the colour to white (RGB **255,255,255**)
t. Right-click on the **300** K breakpoint, and select from the drop down list: **Edit Colours → Interpolate → Left.** The colour bar should look like this:




u. Save the new colour table: Colour Table Editor window: **File → Save As →** Select name