

Lab 1: Viewing GOES Satellite Imagery with IDV

2012 FIU HRSSERP

Page 1

Objectives:

- Become familiar with using a software package (IDV) to view satellite images
- Understand the differences between Visible, IR, and Microwave Imagery
- Observe the influence of dry air and wind shear on TC development

Background:

Researchers use many different software tools to analyze data and images. Integrated Data Viewer (IDV) is a meteorological software package created to allow for easy viewing of satellite, observation, and model data. In this lab, we will use IDV to compare visible, IR, and Water Vapor Satellite Images on a few recent Tropical Cyclones.

Note on memory:

IDV is known to have problems with memory. Make sure to delete your previous image before making a new one. If the program becomes lethargic, try closing and reopening. The satellite loops are especially large. Loops with too many images may cause the program to crash.

Reference Material:

The best way to learn is to reference the User's Guide:

<http://www.unidata.ucar.edu/software/metapps/docs/userguide/userguide.pdf>

Specifically, this lab will reference the following sections.

2.0-2.1: Getting Started and creating an animation loop of Satellite Imagery

-Do not need to go step by step, just use as a reference for navigating IDV

2.4: Surface Observations—METAR and Synoptic Plots

3.0: Dashboard

3.4: Choosing Satellite Imagery

5.2: Image Control (only the Satellite part)

5.4: Data Probe/Time Series

5.7.4: Drawing Control

6.2: Color Table Editor

6.9: Image and Movie Capture

Part 1: Loading and Viewing Imagery

1. Open IDV. There is a desktop link, choose version 3.0u1 or 3.0u2. It can take a few minutes to open.

2. There should be two windows open, the "Dashboard" and "Map View". Keep both windows open, if you close one then you have to restart the program. The map view is basically for viewing data, the dashboard is where you load the data and control everything.

3. The first step in IDV is always to load the data that you wish to view. Go to the Dashboard. Near the top there are 4 tabs: Quicklinks, Data Choosers, Field Selector, and Displays.

-Select the "Data Choosers" tab

-Left menu: Select "Images" under "Sat & Radar"

-Server: adde.ucar.edu

Lab 1: Viewing GOES Satellite Imagery with IDV

2012 FIU HRSSERP

Page 2

-Dataset: IMAGEALL

-Click on "Connect"

-Image Type:

-For visible, choose GOES-East 0.65 μm Visible

-For IR, choose GOES-East 10.7 μm IR

-For Water Vapor, choose GOES-East 6.5 μm WV

-A window should pop up to pick the desired data. Around 1-2 months of data is archived. Choose yesterday's date.

-Times: Drag the box to make the blue rectangles turn red. The times are listed in UTC. Choose about 20 images at most.

-Data Type:

-Visible: Brightness

-IR: Temperature

-WV: Temperature

-Latitude/Longitude: Use 15, -72. Change later if you want to move around.

-Uncheck the "Create Display" Box (lower right)

-Click "Add Source"

4. Field Selector:

-IDV should send you to the Field Selector tab now. If not, click on the tab to go there. The field selector remembers all the data that you loaded and lists it under "Data Sources" on the left. So if you remove a data source from the map, you just have to go back to the Field Selector, do not waste the time reloading the data from the Data Choosers.

-For satellite data, you do not need to touch anything, just click "Create Display" on the bottom. This will bring the image up on the map and switch you to the "Displays" tab.

5. Navigating the Map Viewer:

Option 1: Use the control panel on the left side to pan and zoom

Option 2:

Pan left/right: **Ctrl + Mouse Wheel**

Pan up/down: **Shift + Mouse Wheel**

Pan freely: **Ctrl + Hold/Drag Right Mouse Button**

Create box to zoom in: **Shift + Hold/Drag Left Mouse Button to create box**

Zoom in/out freely: **Mouse Wheel**

Looping images: use control panel directly above the images

The "Legend" on the right side is very important:

-Checking or unchecking the boxes will make images to appear or disappear from the map (you can plot multiple things on top of each other).

-Clicking on the blue title will send you to the "Displays" panel to modify the images further

-Clicking the trash can will remove that image from the map (but remember, it is still saved in the Field Selector, you do not have to reload it from Data Choosers)

Lab 1: Viewing GOES Satellite Imagery with IDV

2012 FIU HRSSERP

Page 3

6. Background map

- Click on the blue underlined "[Default Background Maps](#)" under the legend
- Uncheck "World Coastlines"
- Check "World Country Outlines"
- This should solve the problem with strange green lines that sometimes occurs in IDV 3.0

7. Displays tab

- The most important part about the displays tab is that it allows you to adjust the color table. Visible imagery is ok, but if you chose an IR or Water Vapor image, you have to fix the color scale:
- Go to Dashboard -> Displays and click on the "Gray Scale" -> Edit Color Table
- On the top menu, choose Color Tables -> Basic -> Inverse Gray Shade (or another color table that looks good)
- Fix the range (in Kelvin) to get the color scale to align properly. For the low range, choose the approximate temperature of the coldest cloud tops. For the high range, choose the approximate temperature of the surface.
- Experiment by pressing "Apply" and looking at the Map View until you find a range that looks good.

Practice loading a few different images types and adjusting the settings. Proceed to part 2 when you are comfortable with generating visible, IR, and water vapor imagery.

Part 2: Looking at Imagery

In the following sections we will look at storms from this year (2012) in the Atlantic and East Pacific. Try loading imagery (Visible, IR, Water Vapor) for one of the storms and follow the evolution of the storm at some point in its lifecycle.

To look up the date, lat/lon, and intensity, use the following website:

http://rammb.cira.colostate.edu/products/tc_realtime/season.asp?storm_season=2012

The storms that are available in the IDV archive are:

East Pacific:

- Hurricane Carlotta (June 14-17)
- Hurricane Daniel (July 3-12)
- Major Hurricane Emilia (July 7-18)
- Hurricane Fabio (July 12-18)

Atlantic:

- Hurricane Chris (June 19-22)
- Tropical Storm Debby (June 23-30)
- Tropical Storm Ernesto (August 1 – Present)
- Tropical Storm Florence (August 4 – Present)

Part 3: Presentation

Based on what you looked at in Part 2, capture about 5 interesting images and put them in a Power Point presentation.

-To capture an image, from the map view (just above the left corner of the map), select **View -> Capture -> Image**

-It is also possible to capture a movie of an image loop and embed into a PPT

For each image (or set of images), develop an explanation of how the various visible, IR, or water vapor images relates to the Tropical Cyclone. Specifically, the movement and intensity changes are of most interest. Try to use at least one visible, IR, and microwave satellite image.

For example, given a loop of images of a TC, you could try and answer as many of the following questions as you can. You might not know exactly how some of these questions relate to TC intensity—we will explain more later this week.

Visible Satellite:

1. Find the center of circulation. Is the low-level center exposed or covered by deep convection?
2. Is there any indication of wind shear? (watch the motion of the upper level clouds relative to the lower level clouds)
3. Can you find any hot towers or overshooting tops? Are they near the center or away from the center?
4. What is the structure of the outer bands? Curved or straight? Symmetrical or asymmetric? Is there a single (primary) band or multiple spiral bands?

IR Satellite:

For the IR questions, you can get the exact cloud top temperature using a **data probe**:

-Go to the Dashboard -> Field Selector

-Click on Data Probe/Time Series (under displays)

-Click "Create Display"

-On the map view, a pink square will appear on the map. Drag the pink square around the map while looking at the temperature on the Displays panel. If you set your color table right, it should be easy to find the coldest cloud tops.

1. Where are the coldest cloud tops located? Near the center of circulation or elsewhere?
2. How does the temperature of the coldest cloud tops change with time? Do they get warmer, colder, or vary between warm and cold? Does the location change with time also?
3. Does the temperature of the cloud tops change even when the structure of the rest of the storm remains relatively constant? How does this relate to the storm's intensity?
4. Is there a certain time of day when the cloud tops seem to be the coldest or warmest? Any ideas why?

Water Vapor:

1. Is there any dry air near the storm? Does it look like the dry air is being entrained into the circulation, or is the inner core free of dry air?
2. Can you locate any synoptic features that may be influencing the storm's motion? Upper level lows are usually easy to find on water vapor imagery and can cause locally enhanced wind shear. You can usually also find the jet stream and any associated ridges and troughs.
3. Considering the large-scale geography of the oceans, where does the dry and moist air tend to be located?

Comparing different types of images:

1. If your storm is forming an eye, does it appear first in the visible or IR channel?
2. Which channel is best for finding the center of circulation? Can you give an example where you can see the center on one channel but not the other? (Note: often in weaker storms it is impossible to know exactly where the center of circulation is located!)

Presenting your images:

-At the end of the lab, everyone will give a 3-4 minute presentation on their images. Send your PPT to jzagr001@fiu.edu when you are finished.