# Unit 1: General Review and Global Circulation Concepts

## 

## Learning Activities and Assignments

Included

* [The Trade Wind Inversion](https://docs.google.com/a/comet.ucar.edu/document/d/1Ze_trdpinwvriOnZ4lFRTUxhqGsfrPhl-LzRePi46FY/edit)

Using soundings to trace the trade wind inversion layer over different ocean basins and for different seasons. This activity helps students to understand how the location of the pressure systems influences the cloud layer depth in the tropics.

Suggestions

* Use IR satellite image animations to show the differences among tropical, midlatitude, and polar circulation patterns. Focus on seasonal extremes and transition periods. Have students label prominent features such as the subtropical highs, ITCZ, SPCZ, SACZ,

Guidelines for activity

This activity requires the ability to view and/or download images and animations from the web. Another requirement is the ability to display student submissions using applications such as Moodle, Elluminate, or GoToMeeting. Students submit power point of their analysis with embedded data and descriptions.

* + Sources of global images:

US Naval Research Laboratory, geostationary satellite views around the globe, <http://www.nrlmry.navy.mil/sat-bin/global.cgi>

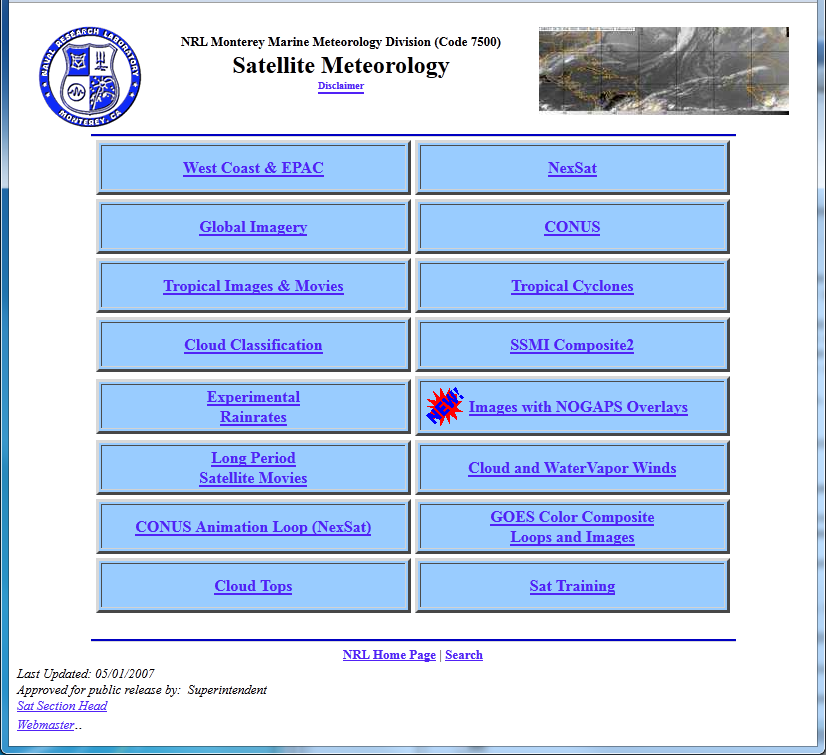
Global stitched plan view image, <http://www.nrlmry.navy.mil/sat-bin/display10.cgi?SIZE=thumb&PHOT=yes&AREA=global/stitched&PROD=cloudtop&NAV=cloud_tops&CGI=cloud_tops.cgi&DISPLAY=Latest&MOSAIC_SCALE=15&CURRENT=LATEST.jpg>

Images with NOGAPS wind and pressure, <http://www.nrlmry.navy.mil/sat-bin/over.cgi>

**Here is an example of how to access global satellite images and display animations**

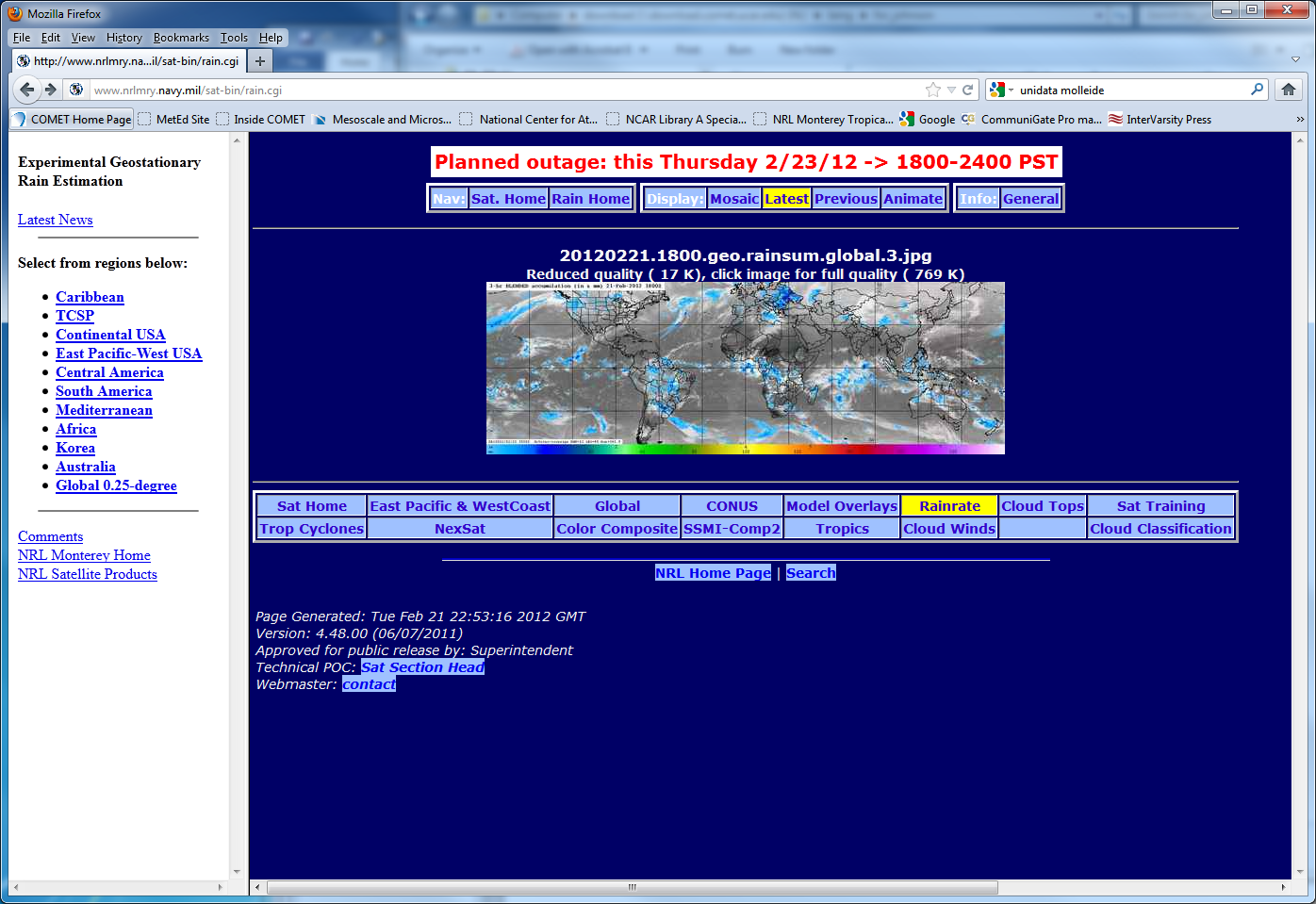
Go to the US Navy NRL Satellite Products Website, <http://www.nrlmry.navy.mil/sat_products.html>

Choose Experimental Rainrates (this example shows images of the whole globe)



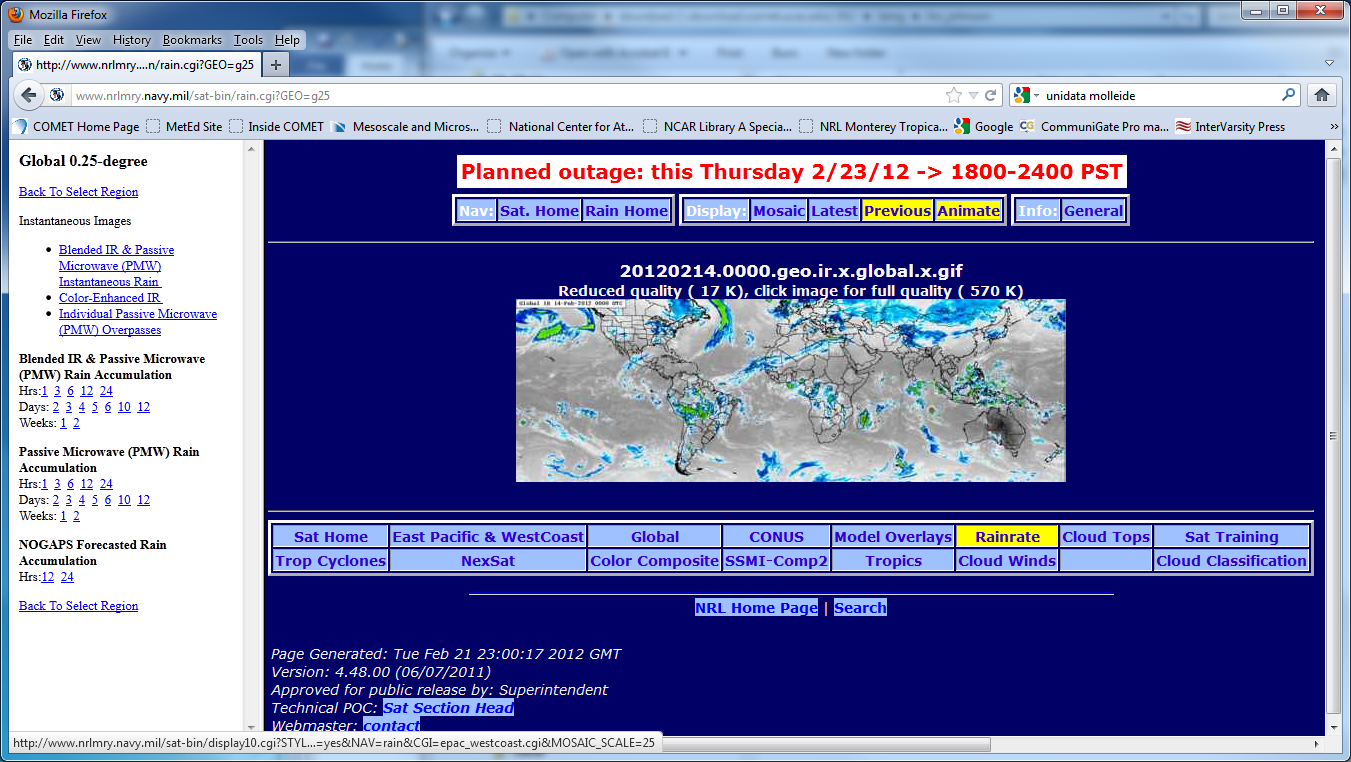
New page is <http://www.nrlmry.navy.mil/sat-bin/rain.cgi>

Choose: Global at 0.25-degrees

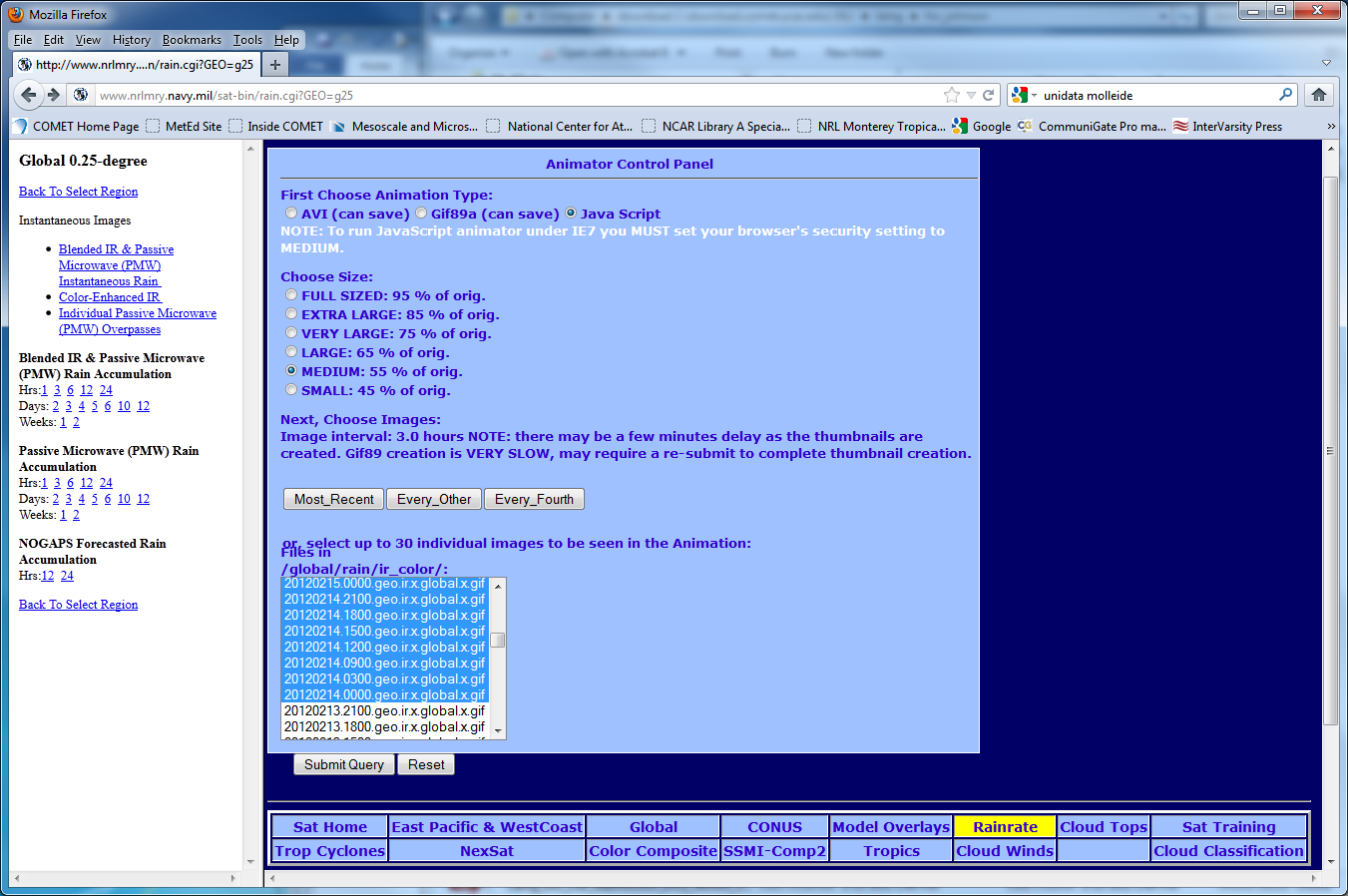


New page is <http://www.nrlmry.navy.mil/sat-bin/rain.cgi?GEO=g25>

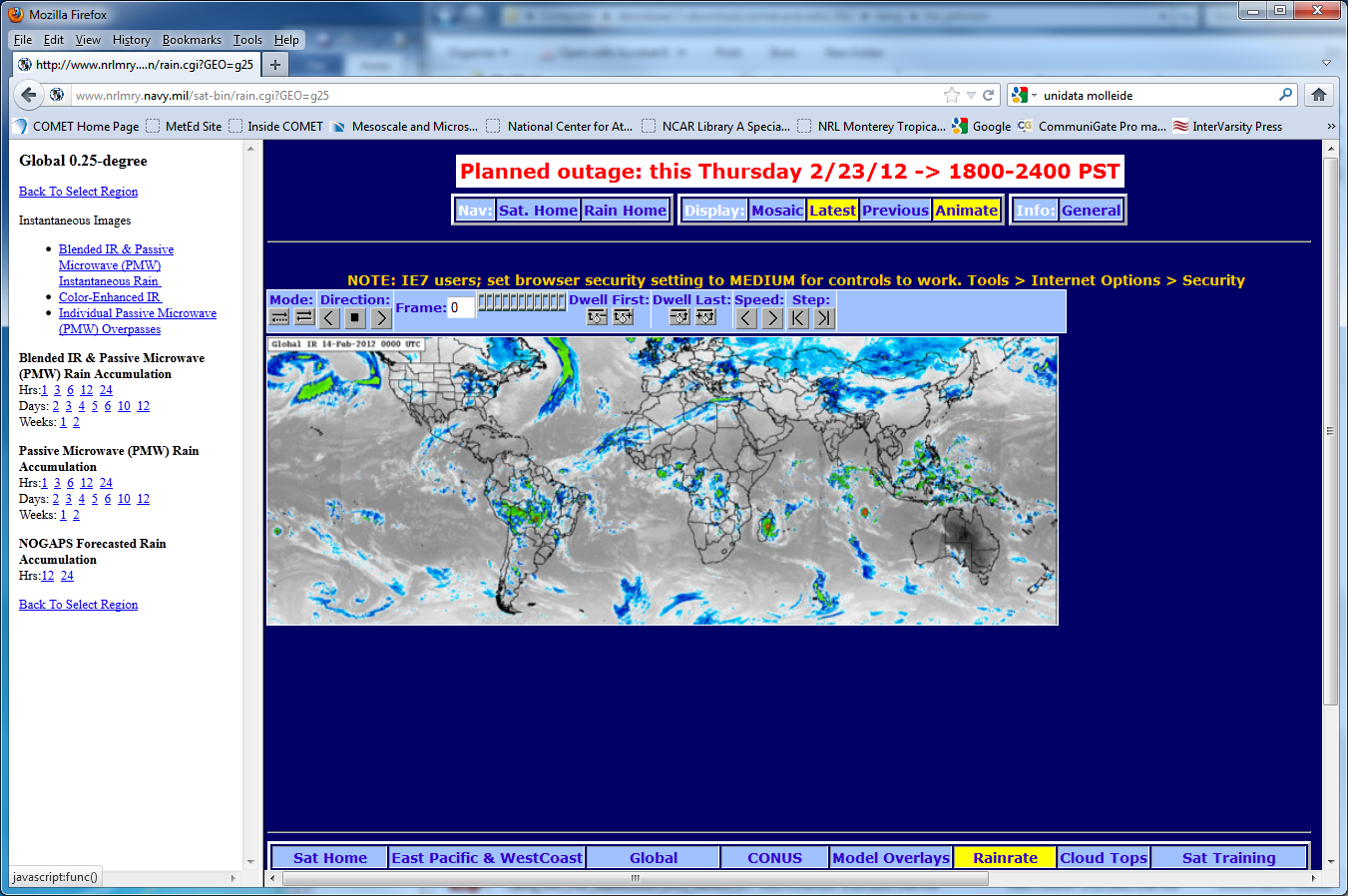
Choose color-enhanced IR, then click on “Animate”



Choose times to animate then click “Submit query”



***Animation appears***! See control buttons for stepping through the images, changing animation speed, etc…



* Use enhanced WV imagery to find the location of the jet streams and midlatitude cyclones (use method similar to above but with global images of water vapor)

Confirm the correct choices by use satellite images overlaid with wind velocity.

Go to the US Navy NRL Satellite Products Website, <http://www.nrlmry.navy.mil/sat_products.html>

Choose “Images with NOGAPS Overlays”



New page is <http://www.nrlmry.navy.mil/sat-bin/over.cgi>

Scroll down to “Jet\_Stream”

* Have students research and plot the path of some of the early voyages of discovery made aboard sailing ships (Columbus or Magellan, for example). Do the routes appear reasonable in light of what the students know about the earth's general circulation pattern?

Guidelines for activity

Students submit power point with maps of the voyages and illustrations of the pressure and wind systems of relevance to the voyages and with explanations for where the ships would need to make significant changes in their course or where they could have been blown off course by significant weather events.

* Observe tropical pressure systems and winds using the US National Weather Service (NWS) Unified Surface Analysis at 0000, 0600, 1200, 1800 UTC for 14 days. Describe the similarities and differences between the observed daily circulation pattern and the general circulation pattern. Highlight station observations that match conditions expected with the subtropical highs, the equatorial trough, the ITCZ. Annotate the relative movement of the midlatitude vs the tropical weather systems.

View 14-day loops of the surface analysis and station observations and link to downloadable images at <http://www.opc.ncep.noaa.gov/Loops/>

* + Download individual images for the Tropical Pacific at <http://www.opc.ncep.noaa.gov/Loops/UA_Pac_Tropics_hires/>
  + Download individual images for the Tropical Atlantic and West Africa at <http://www.opc.ncep.noaa.gov/Loops/UA_Atl_Tropics_hires/>

Guidelines for activity

Students submit Powerpoint with images to support their discussion.

* Monitor and compare the evolution of synoptic weather systems in the tropics and the midlatitudes (e.g., cyclones, cold fronts, troughs) poleward and equatorward of 30° latitude

Use the NWS Unified Surface Analysis to observe systems for several days.

* + View 3, 7, or 14-day loops, <http://www.opc.ncep.noaa.gov/Loops/>
  + Download individual images for the Tropical Pacific at <http://www.opc.ncep.noaa.gov/Loops/UA_Pac_Tropics_hires/>
  + Download individual images for the Tropical Atlantic and West Africa at <http://www.opc.ncep.noaa.gov/Loops/UA_Atl_Tropics_hires/>

Guidelines for activity

Students submit powerpoint with images to support their discussion of the differences and similarities observed between the midlatitude systems and the tropical systems. They should be able to see for example, the predominance of weak pressure gradients over the tropics and stronger gradients towards the poles. Also, if fronts are present, the tropical part of the front will have weaker temperature gradients, may become quasi-stationary, or the temperature gradient will disappear and only the wind shift (shear line) will remain.

* Follow the seasonal changes in the circulation and clouds across the Pacific

<http://www.nrlmry.navy.mil/archdat/long_period/sun.mpg>