# Unit 3: General Mesoscale Phenomena

## Learning Activities and Assignments

* + - * + Explore triggers of convection in the tropics. Mountain peaks, easterly waves, diurnal heating, and island tails. Identify the areas of the tropics that will be typically affected by each and show the differences in areal extent.

Flip the exercise and make it into a discussion using a satellite animation, where student identify examples, then ask what the differences are. Pinpoint areas where it is hard to identify the source and discuss them.

Useful sites for imagery

* US Navy NRL Real-time and archive images, <http://www.nrlmry.navy.mil/sat_products.html>
* US Navy NRL Archive Directories, <http://www.nrlmry.navy.mil/archdat/> (three weeks)
* Suomi NPP VIIRS, High resolution images, <http://www.nrlmry.navy.mil/VIIRS.html>
* NOAA RAMSDIS Tropical Images, <http://rammb.cira.colostate.edu/ramsdis/online/tropical.asp>
* NOAA RAMSDIS Regional Meteorological Training Centers in Caribbean and South America, <http://rammb.cira.colostate.edu/ramsdis/online/rmtc.asp> (four weeks)
* CIMSS, <http://www.ssec.wisc.edu/data/>
* NOAA CLASS Archive, choose area and period of interest, <http://www.class.ncdc.noaa.gov/>
* EUMETSAT Real-time and archive, topical images, case studies, <http://www.eumetsat.int/Home/Main/Image_Gallery/index.htm?l=en> (one week)
* EUMETRAIN Archives

Southern Africa (two years)

<http://www.eumetrain.org/eport/archive_saws.html?width=1680&height=1050>

Atlantic (since April 2012)

<http://www.eumetrain.org/eport/archive_atlantic.html?width=1680&height=1050>

* + - * + Have students identify the causes of/conditions that produce local scale winds in their area, by constructing a wind rose for their city or town (or by finding one in a local climatology). What effects do these local winds have on the local weather?

## Guidelines for activity

Global climate data is available from the US National Climatic Data Center (NCDC) website (<http://www.ncdc.noaa.gov/>), which is searchable by WMO Station ID, by country, and region, or using their interactive map, <http://gis.ncdc.noaa.gov/map/cdo/>

Students submit powerpoint presentation with their wind rose and explanation for the effects on their local weather.

* Make a 3-day (or 5-day, etc.) forecast for your location, and check your progress/verify the results using satellite/radar/surface observations.

Track tropical synoptic phenomena in real-time using

* US Navy NRL real-time satellite data with NOGAPs overlays <http://www.nrlmry.navy.mil/sat_products.html>
* Real-time model analyses and guidance from NOAA/NWS/NCEP, <http://mag.ncep.noaa.gov/NCOMAGWEB/appcontroller>
* Real-time analyses and objective tracking of easterly waves, the University at Albany, <http://www.atmos.albany.edu/student/janiga/web/regional_maps.htm>

Guidelines for activity

Students submit daily forecast discussion (including supporting charts and soundings), and forecast of minimum and maximum temperature, and precipitation amount for the nearest WMO station.

Verify the temperature and precipitation forecast with data from the US NWS International Weather Observations, <http://weather.noaa.gov/> or other sites.

* Explore the mesoscale structure and inner-core structure of tropical cyclones from archived and real-time cases linked from tropical cyclone website of the US Naval Research Laboratory, <http://www.nrlmry.navy.mil/tc_pages/tc_home.html>

Explore the linkage between intensity and eyewall replacement cycles or asymmetry in inner rainbands

Guidelines for activity

Students submit powerpoint presentation with examples and explanations.

* Writing assignments
* Review of a scientific article on mesoscale weather and forecasting in the tropics
* Case study of a high impact mesoscale convective system (e.g., one that is associated with major flooding or severe weather)
* Analysis of tropical weather radar images and identification of mesoscale features presented in the course. See list of tropical radar images websites at <http://www.meted.ucar.edu/tropical/textbook_2nd_edition/navmenu.php?tab=3&page=14.0.0>
* Submit photographs of nocturnal thunderstorms (for places where these are prevalent). Describe the mechanisms that cause thunderstorms to form at night in those areas.

Guidelines for activity

Students submit powerpoint presentation with examples and explanations.