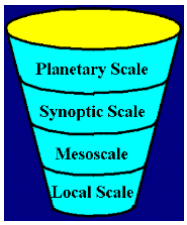
Lecture 5: Weather Discussion and Internet Resources

The Forecast Funnel

The forecast funnel visualizes the analysis and forecast process as a "funnel" from the planetary to local scales. The concept was developed by Len Snellman, a National Weather Service (NWS) Meteorologist (Snellman 1982). Any good synoptic meteorologist will use this to do weather forecast. The idea is as shown in the figure: Always understand the planetary scale (waves) background first, then go to synoptic scale (such as frontal cyclones), then mesoscale (such as Mesoscale Convective Complex [MCC], Mesoscale Convective System [MCS],& sea breeze), and finally local scale (such as super cells, tornadoes).



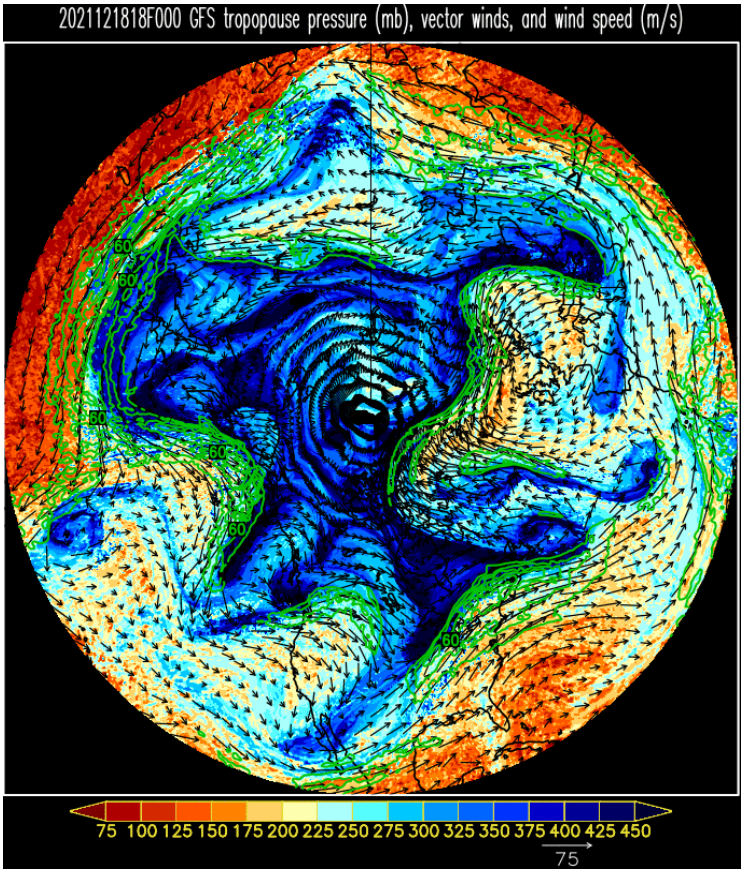
How to prepare your weather discussion?

Putting together a weather discussion can be an intimidating process. Assembling figures and graphics loops can consume much of your preparation time, allowing little time to think about the weather. Here are some suggestions to help you be as prepared as possible for the discussion.

- Go to the computer lab the day before your discussion and don't leave until you ***feel the weather in your veins***. Then determine what you will likely need to focus on at tomorrow's discussion.
- Use the ***forecast funnel*** to gain an understanding of the past, present, and future weather. Pick two or three major issues to discuss. Critical to this process is developing an intuition for (1) recognizing the social and/or scientific significance of weather events and (2) identifying the major forecast problem(s) of the day. Developing such intuition can only be done by making every effort to ***understand and predict the weather on a daily basis***. Kudos if you keep a daily weather journal.
- Prepare a ***manual*** surface analysis on the morning of your briefing (and preferably on a daily basis, WPC hourly surface weather data maps can be obtained at https://www.wpc.ncep.noaa.gov/sfc/sfcobs/sfcobs.shtml). Even if it is not a work of art, the process of performing a manual analysis results in a much more in-depth understanding of the weather than can be gained by looking only at numerical analyses and forecasts.
- During your briefing ***never deviate from the forecast funnel***. Always start with the large scale and descend down to smaller scales. For example, if discussing the development of monsoonal convection over southern Utah, first use satellite imagery and synoptic analyses to define the evolution of the large scale before jumping to radar imagery and mesonet analyses. For example, a good outline follows below. You should explore all the websites listed below:

  Planetary-scale overview:
  - The recent (last 2-5 days) large-scale upper-level flow evolution based on Northern Hemisphere 500-mb heights/vorticity or dynamic tropopause analyses. These can be obtained from http://weather.utah.edu/. One example on this website: Click “GPS-0.25 Deg” tab on the left, you’ll see a loop showing graphs like the one below. This is the Northern Hemisphere 500-mb tropopause pressure (colored) overlaid with wind vector and wind speed. Cold colors indicate troughs, and red colors are ridges. This is an excellent illustration of planetary-scale systems (waves). Please pay attention to the labeled UTC time in each image. The loop starts from the previous 48 h to the present and go into forecasts of up to 240 h in the future. The time label “2021121818F000” means that this image is from observational analysis for Dec 18, 2021 at 18Z. “F000” means it’s not a forecast image, but an analysis

from observations. The time label "2021121818F240" means that this image is a GFS model forecast for 240 h in the future with the forecast made at 18 Z on Dec 18, 2021.



Synoptic-scale overview:

- Check NWS's Weather Prediction Center (WPC) North American Surface Analysis: https://www.wpc.ncep.noaa.gov/html/sfc2.shtml

- CONUS-scale weather using WV, IR, and VIS satellite imagery, which can be obtained from http://www.meteo.psu.edu/~gadomski/ewall.html or https://www.star.nesdis.noaa.gov/GOES/

Regional scale:

- Regional-scale weather: look above items in regional scale, for example: https://www.nhc.noaa.gov/satellite.php

Local scale (Forecast for Miami FL):

- Soundings (KMFL [Miami] and possibly elsewhere in the region) using http://www.rap.ucar.edu/weather/upper/
- or http://weather.uwyo.edu/upperair/sounding.html

- AMX (Miami) radar imagery using http://www.weather.gov/radar_tab.php

- Surface observations for Southern Florida using http://www.rap.ucar.edu/weather/surface/

- ***From resources above, you can make your nowcast for the afternoon (16-04Z) maximum temperature and 16-22Z precipitation amount.***

- Forecast maps: http://weather.rap.ucar.edu/model/index.php?model=gfs
  -Check boxes through 48 hours, look at:
  -300 mb: Troughs & ridges (jet streams)
  -500 mb winds & 500mb vorticity
  -850 mb Temps/Humidity
  -surface precipitation

- ***From resources above, you can make your forecast for the overnight (22-16Z) minimum temperature, next day (10-04Z) maximum temperature, and 22-22Z (daily) precipitation amount.***

Medium Range (3-7 days) Forecasts:

- The GFS medium range forecast: http://wxmaps.org/pix/gfsmr.fcst.

- ***Keep it simple and specific***. Stay focused on the 2-3 issues. Describe what you know, raise questions about what you don't. Don't hand wave, and don't try to use new techniques you've just learned in class if you haven't had a chance to absorb and understand them.
- ***Spend more time discussing observations and less time discussing model forecasts***. There are 6 questions that need to be answered when forecasting (Bosart 2003), and the first four are: ***What happened, why did it happen, what is happening, and why is it happening?*** Answer these questions before moving on to the NWP guidance. The final two questions are ***what is going to happen and why is it going to happen***. Total reliance upon NWP guidance to answer these questions should be avoided.

Other On-line Resources (the first two are highly recommended for you)

Weather Prediction Education: http://www.theweatherprediction.com/

Elizabeth Tuttle's Weather Map Site
http://mysite.du.edu/~etuttle/weather/weather.htm

CIMSS Tropical Cyclones Group
http://tropic.ssec.wisc.edu

Earth Wind Map
https://earth.nullschool.net

GOES Satellite Imagery at NASA/MSFC
http://weather.msfc.nasa.gov/GOES/

JETSTREAM (NWS Southern Region Online Weather School)
https://www.weather.gov/jetstream/

Miami Weather Forecast Office
https://www.weather.gov/mfl/

National Hurricane Center
http://www.nhc.noaa.gov

NCEP Model Analyses and Guidance
https://mag.ncep.noaa.gov/

Tropical Tidbits
https://www.tropicaltidbits.com

Decoded METAR Surface Observations (from the University of Washington):
http://www.atmos.washington.edu/~stoves/td.cgi

GFS MOS Products:
https://vlab.noaa.gov/web/mdl/short-range-gfs-mos