

Guidelines and Philosophy for Weather Discussions

You have already received instruction on the elements of a proper forecast briefing in MEA443. These fundamentals apply equally to MEA444. We will especially emphasize the following as we go forward.

I. Team setup and participation

Based upon which days are best for which students, we will have three teams of 9 students each. The teams are “Tuesday”, “Wednesday”, and “Thursday”. On a rotating basis, two (or four) people from a day’s team will lead the afternoon briefing. However, this doesn’t mean that the other team members are off! On Tuesdays (for example; the same goes for the other days), **every** non-presenting member of Team Tuesday must post their forecast thoughts to our class forum at: <http://wolfware.ncsu.edu/wrap-bin/mesgboard/mea:444::001:1:2008>

You should support your team members who are briefing that day by sharing your ideas, pointing out any subtle features that they might have missed, and commenting on what you think will be the most important forecast problems of the day. Your forum contributions **will** be graded by Dr. Parker both as a part of your participation grade (are you posting or not?), and as a part of your forecast grade (what is the quality of your content?). The goals of this approach are a) to get more people thinking and communicating about the weather every day, and b) to give students some practice writing in the style of NWS-like forecast discussions. Students from the other teams (who are on their “off days”) can then review your forum discussion and have some idea of what to expect during the day’s briefing.

II. Mechanics for briefing leaders

- 1a. You must prepare a Powerpoint show for your discussion (so that your thoughts are organized and so that all of your plots are clearly labelled). Your slides should identify what is plotted on every image that you show... this includes the time that the plot is valid, the source (observations? RUC model analysis? 12 hour NAM forecast?), and of course, the fields that are plotted. If it is not plainly obvious, then you also need to explain which color contour corresponds to which field.
- 1b. You may use either GARP/NForecast images or images from the web. There are certain products that are available only online (e.g. SPC mesoanalyses). There are other fields (e.g. 800 mb relative humidity) and configurations (e.g. vertical cross sections) that are not available online and for which you should always use GARP. Be sure to exploit NSHARP as well.
- 1c. I make the following exceptions for the Powerpoint requirement: a) you may create a link within your PPT show to an external animation if it is too difficult to get it into PPT as an animated GIF; b) particularly for unfolding convective situations, you may make a link at the end of your PPT show to go to real time radar/satellite/surface or watch/warning data, as a great deal may have changed since you prepared your briefing earlier that day.
- 1d. You will present your briefings in the new 5214 weather lab. You can use the Linux powerpoint emulator, which is called OpenOffice.org Impress (find it in the Applications pull-down under the “Office” category). Your audience members will be seated at the Linux terminals in the

lab and will be able to investigate data and raise questions and comments based on what they've seen in their own analyses.

2. Speak loudly enough that someone in the back of the room can hear you (over all the CPU fans, etc.)

III. A forecast discussion has six fundamental components (Bosart 2003)...

1. What happened?
2. Why did it happen?
3. What is happening?
4. Why is it happening?
5. What is going to happen?
6. Why is it going to happen?

Many people focus only on number 5, and do so only from the perspective of numerical model forecasts. Far too often, a forecaster picks a *model du jour* ("it just seemed like it had a better handle on things") and then presents only this model forecast! That's not a rigorous forecast process, and it is especially harmful when it comes to convective and mesoscale meteorology (where the devil is in the details). A "5-only" approach eliminates any insight that could be gained from the events leading up to the present, and fails to teach us about the physical processes that are key to the day's forecast. A complete briefing must touch on all six categories above. We are seeking *understanding*, so we will especially emphasize items 2, 4, and 6. Our focus is on the phenomena and processes, and their governing dynamical principles.

If you make a handwavy claim, expect to be asked to explain and justify it. This is not a class about memorizing rules of thumb: it is a class about *understanding physical processes*. The true meteorologist is a scientist, not a look-up table. Along with the above, be wary of "map room lingo", because it sometimes short-circuits the thoughtful application of concepts: say what you mean, and make sure you understand what you're saying.

IV. The forecast funnel

We begin at the largest scales (i.e. hemispheric), and progress down through the synoptic scale, mesoscale, and convective scale. It is insufficient to immediately jump to the convective scale, especially when looking forward in time. Many mesoscale details are slaved to synoptic scale processes. If you haven't looked for those synoptic scale processes, how will you know whether things are evolving/progged to evolve in a consistent way? It is also insufficient to stop at the synoptic scale without considering mesoscale and convective scale developments. What could complicate the forecast? Lake effects? Convection? Slope flows? Cold air damming? On all scales, the emphasis should be on identifying and explaining the key forecast problems, while excluding irrelevant or marginally relevant information.

V. Mesoscale short-term forecasting must be obs-centric

Especially when it comes to convective forecasting, we are often looking out hours, not days. The atmosphere has a fair amount of memory on these time scales. Old boundaries, mesoscale vortices, precipitation systems, and cloud decks do not disappear instantaneously, and models often exclude them from their initial conditions (do you understand why?). A human who is aware of the observations can synthesize them into a 4D conceptual model of the atmosphere and pick up on many important cues that are missing or misrepresented in the models. Especially for the purposes of convection forecasting, models do not forecast mixed layer thermodynamic properties particularly well. As well, cloudiness that is readily apparent to the human observer

may be poorly represented in models, and make substantial differences to surface temperatures and dewpoints. Convective initiation in most operational models is also often counter-intuitive because it is parameterized. A thoughtful use of observations is the key to rising above these model limitations.

VI. Assemble *all* of the relevant data sources

Along with being obs-centric, we must assimilate as much information as possible. Taking the easy route is a recipe for missing important things and busting forecasts. For example, it is dangerous to only look at a plan view map of CAPE. How is that CAPE distributed in the vertical? What is the quality and depth of the source regions for the high CAPE parcels? Are these moist parcels with LCLs of 1 km, or dry parcels with LCLs of 3 km? It is much better to examine the individual raobs, the individual upper air maps, the surface chart, the wind profilers, and the radar and satellite images. Get down and dirty with the real data! Once you know how the thermodynamic and kinematic properties of the atmosphere are distributed, it is acceptable to go to the derived parameters as a summary. Then, in addition to seeing CAPE, you know where it is comparatively warm and cool aloft, and what the large-scale evolution of the pattern will do to modify those CAPEs. In addition to seeing storm-relative helicity, you know what the wind profiles look like, the directions in which storms will move, and the ways in which height rises and falls throughout the troposphere will impact the hodographs. Skipping even one dataset is risky... an outflow boundary that is completely obvious in visible satellite images may be difficult to detect in the surface observations. Throughout this process, you must think 4-dimensionally: animate data leading up to the present, so that you are seeing the evolution, not just a snapshot.

These things take *time*. But, laziness is never an acceptable excuse for a blown forecast.

VII. Timing is important too!

In forecasting deep moist convection, timing is of the utmost importance. Will initiation occur during the hours of peak heating, or will convection be suppressed until after dark? Forecasters must identify the key features upon which the forecast hinges, and then assess a) whether the models are representing them adequately, and b) how the timing of these features varies among the models, and in successive runs of each model. The trend in model forecasts, and the trend in model errors, is often as important as the most recent forecast run.

VIII. This is a workshop, not a lecture!

There should be lots of interruptions, questions and follow-up. You will be graded on your performance as audience members, too! What's going on at that particular station? How did you get that idea from this plot? Did you consider...?

IX. Forecast game

As mentioned, the emphasis in this class is not so much on getting the right numbers as on **understanding**. Even so, to get more practice and to give us a reason to keep looking at the weather even when we're not leading the briefing, we will play a forecast game. The rules will be distributed in a separate handout. Briefings should be tailored toward the forecast sites for the day (the away city will almost always be a place where something interesting is happening). **But**, the focus of your briefing should be on the key processes for the forecast sites, **not** on the numbers you plan to use for the forecast contest. Also, when you give a briefing it is appropriate to provide some commentary on the previous day's forecast. However, as before this commentary should be based on what went right and what went wrong in terms of the expected physical processes. It is

not particularly useful to say “They said a high of 60 and it’s currently 58 so that’s looking pretty good.” We are *all* probably already watching the observations on our own.

X. Parker’s quick and dirty forecast workup

I like to do the following to prepare myself for a forecast. You may find that this is a good way to get up to speed on the day’s weather, and you may even wish to use this template as a rough first outline of what your briefing will look like.

What has happened?

- Last 5 days’ 500 mb heights and surface analyses
- Last 24 hours’ water vapor, infrared, and radar imagery

What is happening?

- Current heights and winds at jet level
- Current heights, winds, vorticity, and temperature at 500 mb
- Current heights, winds, temperatures, and RH at 700 and 850 mb
- Current surface T, Td, MSLP, and winds
- Last 3–6 hours’ water vapor, infrared, visible, and radar imagery (encore)
- Observed soundings within and upstream from areas of interest
- Most recent SPC convective outlooks... if storms are imminent, then:
 - Observed soundings within and upstream from convective areas
 - SPC mesoanalyses of CAPE, CIN, deep layer shear, helicity, and others

After viewing the above, construct a brief narrative (mentally or in writing) of what you expect to happen: identify regions of CVA/NVA and WAA/CAA... pattern evolution, regions of ascent and descent, tendencies in surface cyclones/anticyclones based upon QG theory; identify regions of enhanced moisture/RH (think vertically as well as horizontally)... likely cloudiness, likely conditional instability, likely precipitation; identify regions possessing ingredients needed for mesoscale/convective weather. **ONLY NOW is it time to begin looking at the model forecasts!**

What will happen?

- General survey of GFS, NAM, and RUC 500 mb and surface forecasts
- Assess credibility given analysis of past and present weather
- Find consistencies and inconsistencies among models and assess them
- Use the forecast funnel (i.e. Section III of this document and know-how from MEA443)
 - Don’t forget to look at forecast soundings in areas of interest
 - If SPC forecasts storms for the period, look at relevant model forecast fields: CAPE, CIN, deep layer shear, helicity, etc.

With some practice, this basic workup can be accomplished in about 30 minutes.