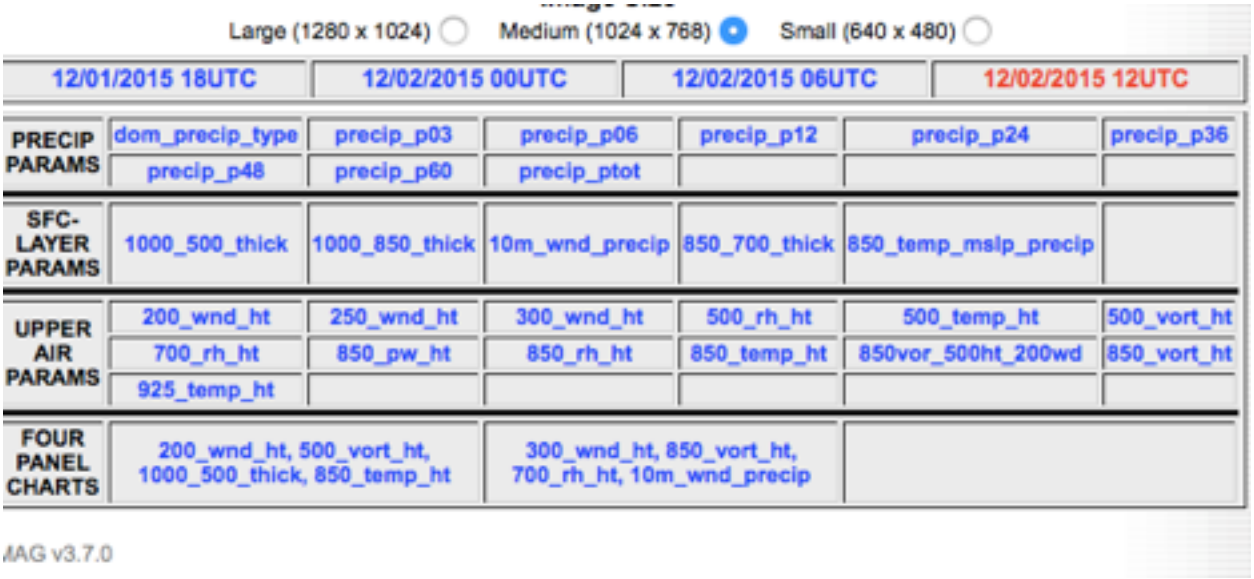
Hi Guys,

Here are my notes from our Advanced Wx Class held on Nov 17, 2015.

The focus of this class was clouds. Clouds and their characteristics are one of the hardest elements to forecast. There are two kinds of forecasting tools - ones that look across a wide geography at a certain level in the atmosphere (synoptic), and ones that drill down the atmosphere and "pinpoint" a particular location. It's hard to find tools that do both, but there are a few in the experimental stage.

First the synoptic.
One of the best tools to start with is the GFS model solution. We have discussed how to use these models in the past and we won't cover that again here with one exception. There are two models that give a fairly precise prediction of precipitation. You can choose them from this menu...http://mag.ncep.noaa.gov/model-guidance-model-area.php?group=Model%20Guidance&model=gfs&area=namer&ps=model (If you have trouble locating it a simple way to find it is to search for "Model and Guidance" and Google will almost always return it first).

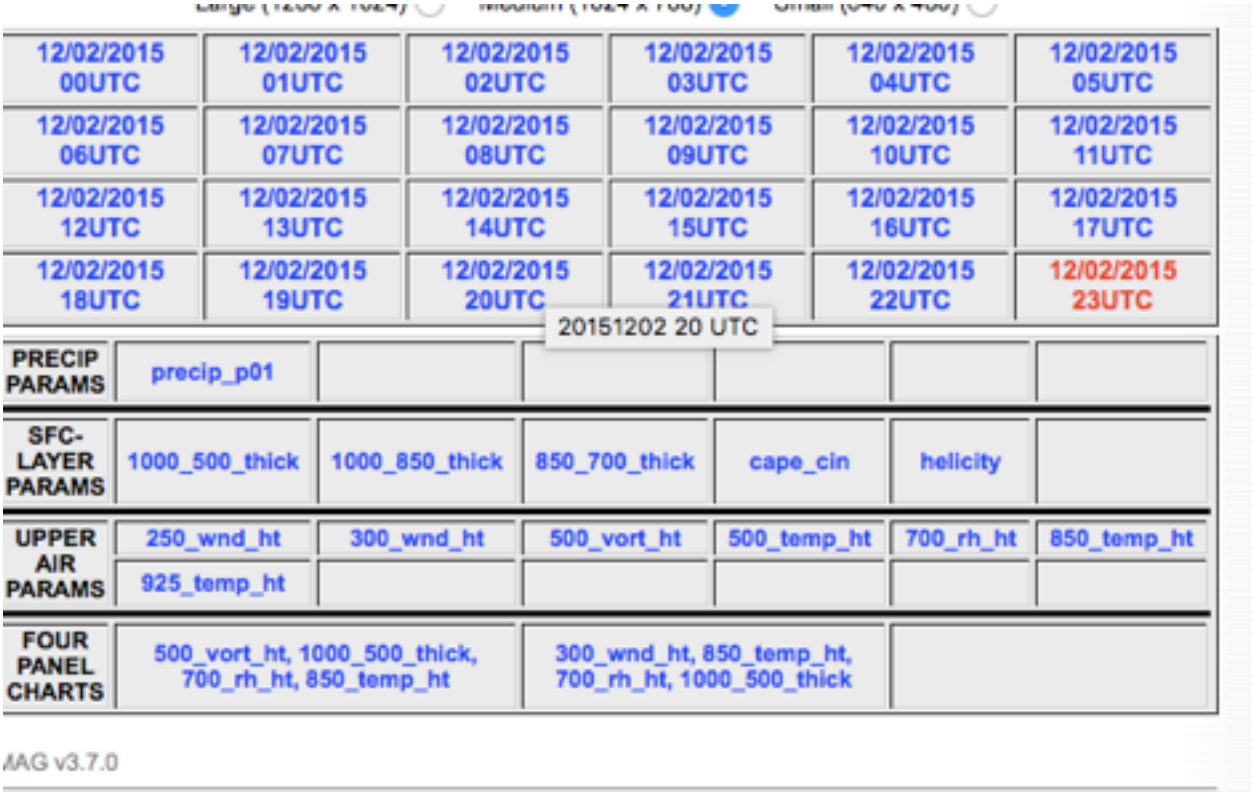
Select "NAMER" and "GFS", then from the next menu (below), choose the 3 hour precip model - it's in the top row, second column entitiled "precip_p03".



Most of the models we look at cover a period of 6 or even 12 hours. The 3 hour precip model covers the next 10 days and does a better job of isolating when precip will likely start.

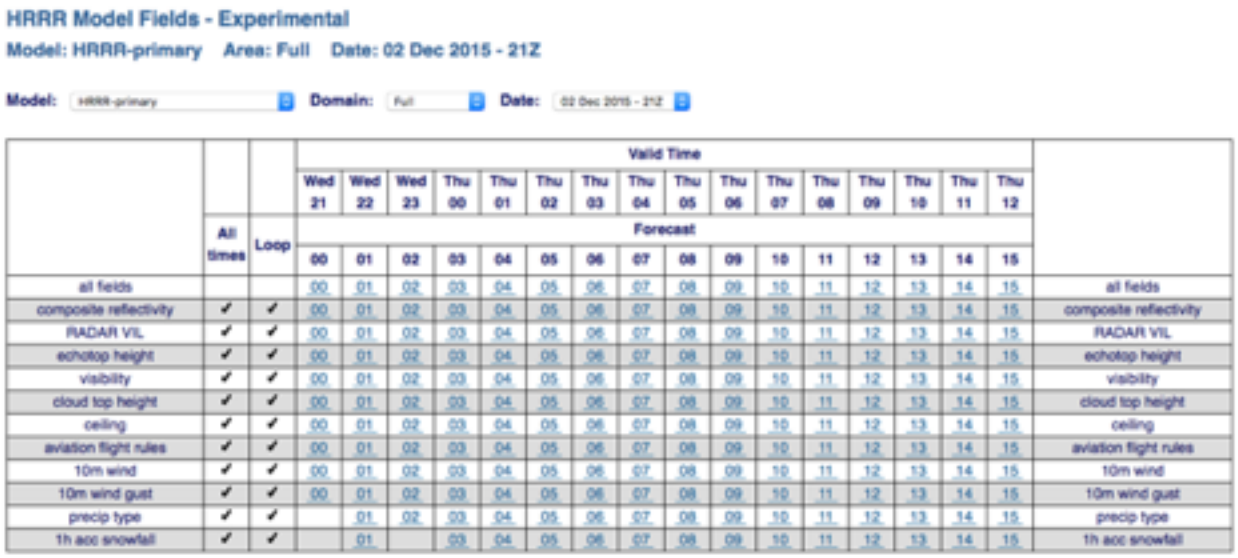
Another model, with even higher resolution is the Rapid Refresh, (or RAP), with one hour windows. From the "Model Guidance" intro page, choose NAMER and RAP…

and then click on "precip_p01"



You will get some amazing detail about precipitation timing and it runs every hour, but unfortunately, it only looks forward 18 hours. Great for “day-before” flight planning.

We discussed some other interesting tools that are in the experimental phase today, but will become mainstream in 2016. One of the most promising is the Hi-Res Rapid Refresh, (or HRRR for short). You can find it here...http://rapidrefresh.noaa.gov/HRRRavi/Welcome.cgi or by searching for "HRRR Model Fields”, then choose HRRR - Aviation Hourly from the menu on the left, (this will bring up the most commonly used aviation elements). When you get to this menu…



HRRR Model Fields - Experimental

Model: HRRR-primary Area: Full Date: 02 Dec 2015 - 21Z

Model: HRRR-primary **Domain:** Full **Date:** 02 Dec 2015 - 21Z

	All times	Loop	Valid Time: Wed 21	Wed 22	Wed 23	Thu 00	Thu 01	Thu 02	Thu 03	Thu 04	Thu 05	Thu 06	Thu 07	Thu 08	Thu 09	Thu 10	Thu 11	Thu 12	
			Forecast: 00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	
all fields			00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	all fields
composite reflectivity	✓	✓	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	composite reflectivity
RADAR VIL	✓	✓	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	RADAR VIL
echotop height	✓	✓	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	echotop height
visibility	✓	✓	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	visibility
cloud top height	✓	✓	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	cloud top height
ceiling	✓	✓	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	ceiling
aviation flight rules	✓	✓	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	aviation flight rules
10m wind	✓	✓	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	10m wind
10m wind gust	✓	✓	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	10m wind gust
precip type	✓	✓		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	precip type
1h acc snowfall	✓	✓		01		03	04	05	06	07	08	09	10	11	12	13	14	15	1h acc snowfall

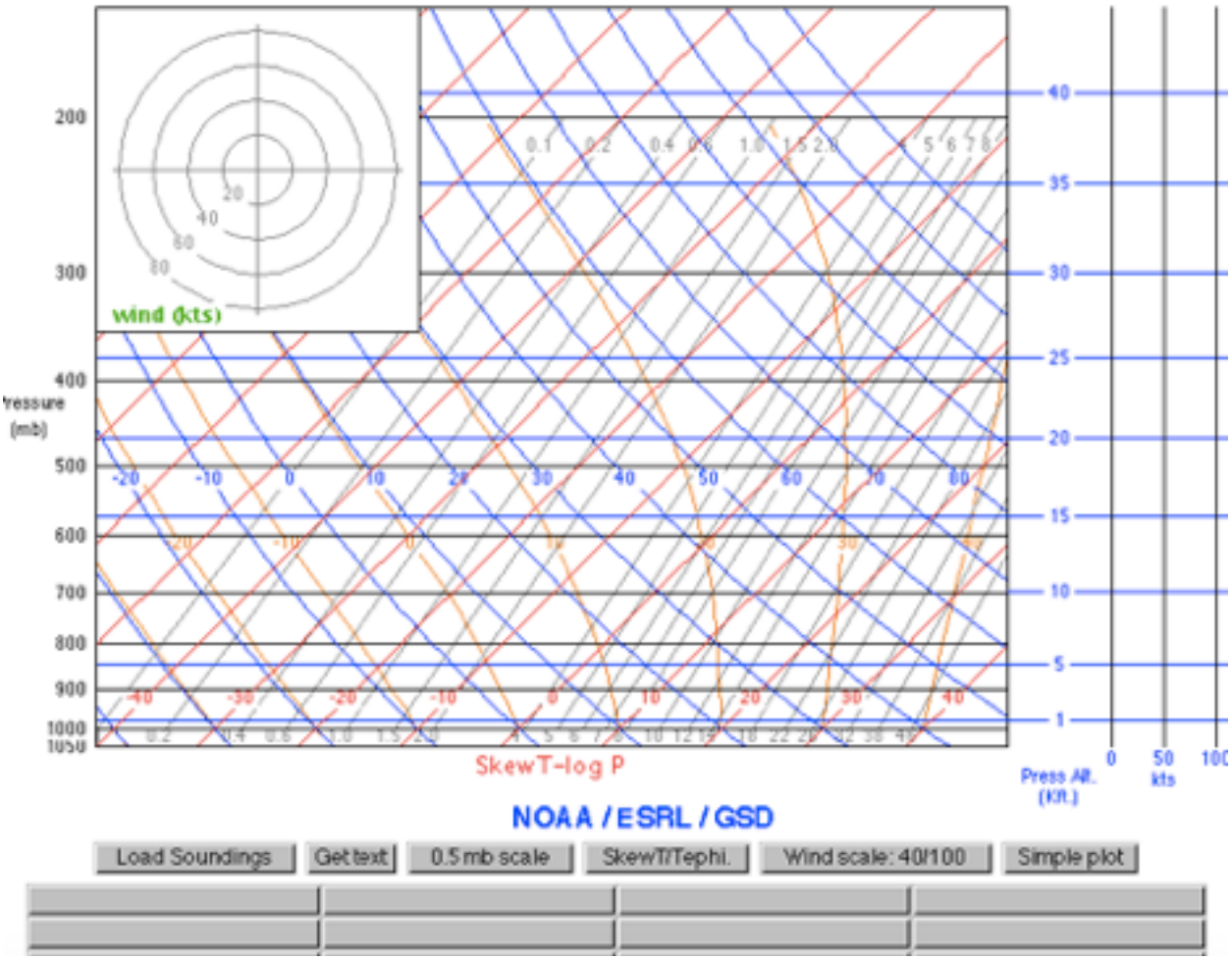
you can choose a number of very helpful “day-before-the flight” forecasts, such as visibility, ceiling, wind and aviation flight rules, (and for Jim Hudson - 1hr accumulated snowfall). The dates and the zulu times for the forecast run across the top of the menu, or you can click on “loop” to see them all in succession. It helps with resolution if you choose NW or Northwest in the Domain drop down box at the top of the menu. It also allows the model to run faster and download quicker if you’re on a slow connection.

As Preston mentioned in the class - HEMS is also a valuable tool that is now mainstream. It was developed for the benefit of Helicopter EMS pilots. You can find it here...https://www.aviationweather.gov/hemst or just search for HEMS.

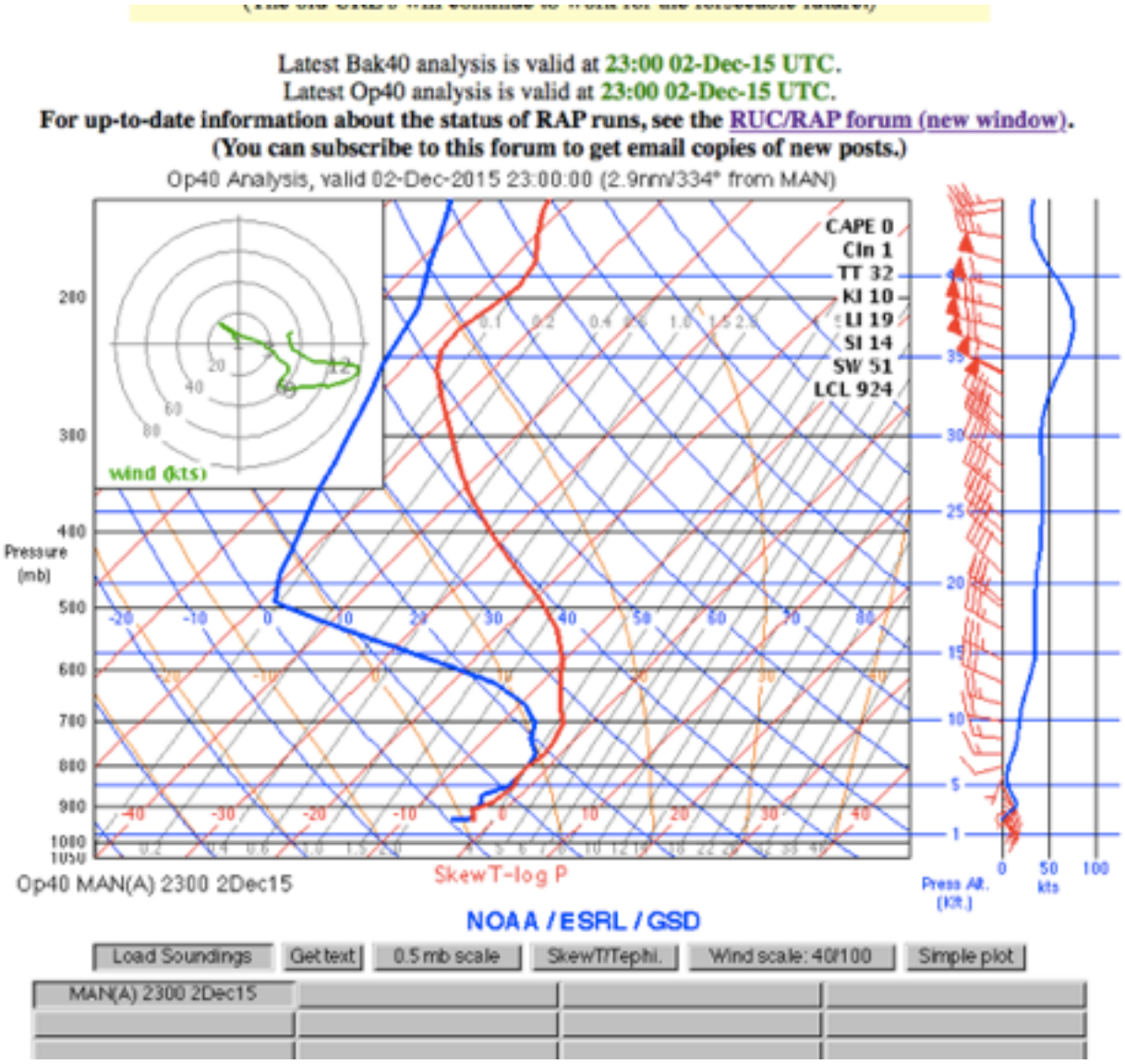
Now for the “pinpoint” tools. These are forecasting models that look at a specific grid within the forecast model geography and give a horizontal view of what’s being predicted in the atmosphere at that location. The most commonly used tool is the Skew-t, named for the skewed log scale on which the data is recorded. Forecasters having been using the Skew-t for decades to display data from weather balloons. Skew-t’s are now used by the most common weather models - like GFS - as a method to view model output statistics (MOS) from model runs. Universities have been given grants and private wx forecasters such as Unisys, have develop web-based tools that output Skew-t plots. One of the most common is GSD Soundings from RAP, (formerly known as RUC), that can be found here...**http://rucsoundings.noaa.gov/plot_soundings.cgi?…**
When you reach the right location, it will look like this…

The new URL for this page is **http://rucsoundings.noaa.gov/plot_soundings.cgi?...**
The new URL for non-java soundings is http://rucsoundings.noaa.gov/gifs/
(The old URL's will continue to work for the forseeable future.)

Latest Bak40 analysis is valid at **23:00 02-Dec-15 UTC**.
Latest Op40 analysis is valid at **23:00 02-Dec-15 UTC**.
For up-to-date information about the status of RAP runs, see the RUC/RAP forum (new window).
(You can subscribe to this forum to get email copies of new posts.)

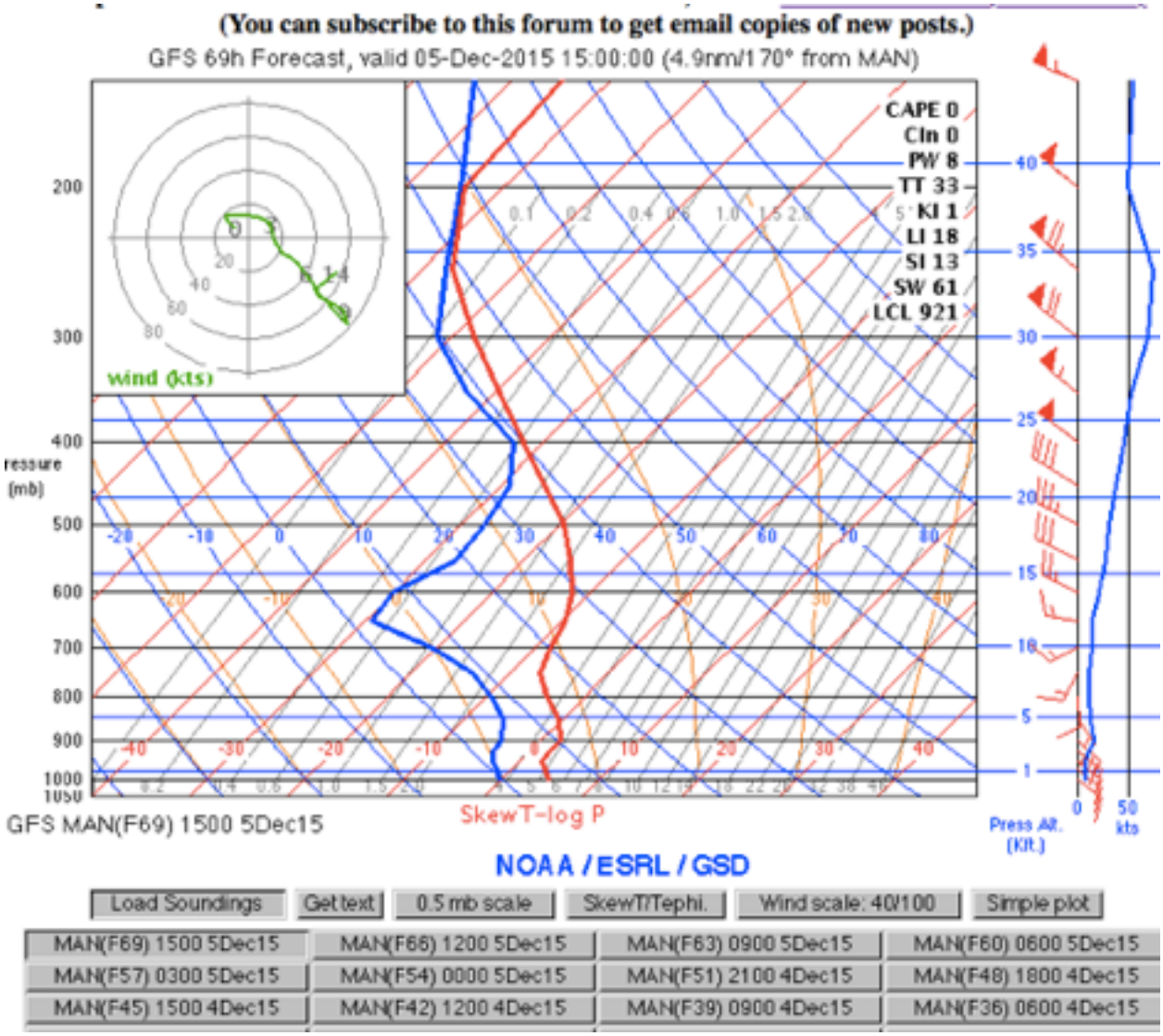


This looks really complex but considering the amount of information it contains, it's relatively simple. Temp laterally across the x axis, height (MSL) and pressure are on the y axis - pressure on the left - altitude on the right. The red lines running from lower left to upper right are temp lines running diagonally, (or skewed). The lines running from lower right to upper left are lapse rates, (dry and moist - air rises at different rates depending on moisture content). The right side of the diagram shows wind direction and speed at different altitudes. The box in the upper left is called a hodogram and maps the direction of a wx balloon. To run the program press the bar labeled "Load Soundings" and a Java box will appear. Put a 3 digit airport code in the box at the top, check latest, put 1 in the number of hours to load box and press the Op40 button and you should get something that looks like this…



The red line represents temp on the diagonal sloping upward to the northeast, (you can see at the bottom of the red line that it starts roughly halfway between -10° C and 0°. The dewpoint is represented in blue. When the dewpoint and temp get close together, or touch, cloud bases (or fog), will be at that altitude. In this example, you can see the red and blue line touch from roughly the surface all the way up to 7000 ft MSL, which can be intrepreted as a cloud layer with bases at surface and tops around 7000, representing our famous winter-time temperature inversion, where it's 26°F on the ground and 34°F at 7,000 ft. MSL.

The morning of Saturday, Dec 5 shows a very different picture…



I used the GFS button instead of the Op40, because the GFS can forecast out 72 hrs while the Op40 goes out 18. This Skew-t shows high clouds up at 25,000 ft, which would indicate incoming low pressure, (which the GFS is predicting) and warmer temps, (at least above freezing!).

Much more information can be derived from the Skew-t, including stable or unstable atmosphere and potential thunderstorms but for now we will keep it simple and just focus on the the cloud forecast. I have found the Java program to be a bit unstable on my Mac, (as I demonstrated in our class), so at times you may have to reload it if it freezes.

Check out the links on the bottom of the plot page to get more info on how to read the Skew-t. You can input lat/lon coordinates to get forecast locations as well as METAR stations.

There's an iPhone app for calculating Skew-t's. It's $9.99 - I have been using it and find it a useful addition and easy to use.

SkewTLogPro by IP Banc, Inc.
https://appsto.re/us/gxbkF.i

I hope you are able to use these tools to increase your ability to fly safe, and be a better pilot, but keep in mind - these are forecasts derived from statistics and are prone to errors - so make sure you leave yourself margin in your flight planning and a well-defined Plan B when flying.

Wishing you clear skies and tailwinds,

Bill