What's the difference between FNL and GFS?

FNL and GFS are related, yet different products from the same data assimilation and forecast system. They share the same underlying model and data assimilation techniques. They contain the same data sources--but there is a subtle difference in the amount of "real" data assimilated into the initial conditions for GFS and FNL.

It takes time to run a global NWP model, even with NCEP's vast computational resources. Thus, they need to start GFS early enough to get a forecast instead of a hindcast.

FNL is the final analysis, delayed a bit from GFS so that they can include all of the available observational data. Typically, FNL ingests about 10% more observations than GFS. Even with the late start, it is still available in time so that the 6-hour FNL-based forecast can be used as the background field for the next GFS data assimilation cycle.

For instance, if you want balloon data from 00Z, you have to wait for the balloon to rise through the atmosphere. That can be as much as 90 minutes for the large size balloons capable of reaching the stratosphere. Then the balloon data needs to be relayed from locales around the world to NCEP in Maryland, USA.

If you want satellite data for 00Z, you have to wait for the satellite to go over a ground station so it can download the data. The ground station then relays the data via land or undersea cable (if it has one) or hopscotches it through another (communication) satellite.

A table at the link below shows the actual initiation time for each analysis/forecast cycle initiated (30 day running average).
http://www.nco.ncep.noaa.gov/pmb/nwprod/prodstat/index.html#TARGET

The first picture is an image of the top of the current status page.

CURRENT STATUS OF THE NCEP PRODUCTION SUITE
AT 05 Dec 2014 18:45 GMT (18:45 UTC)

[The average start and stop times are based upon a 30-day running average.]
If this page fails to update after 5 minutes hit reload to clear cache.

Click here for the frames version of this page.

Images of NCEP's forecast models can be viewed here

Subscribe to the NCEP Production Suite change notification mailing list at: http://www.nco.ncep.noaa.gov/pmb/jifmemo/

CURRENT STATUS OF COMMS TO NCEP CCS	UP

NCEP/NWS STATUS MESSAGES

The LEGEND is at the bottom of the page.

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00 UTC CYCLE

00 UTC NAM

EVENT	Average Start Time	Average End Time	STATUS	COMMENTS
DATA DUMP AND PREP	01:15:03	01:21:59	COMPLETE-01:22:48	ON-TIME
ANALYSIS	01:22:04	01:30:58	COMPLETE-01:32:39	ON-TIME
FORECAST F00-F84	01:31:23	02:39:46	COMPLETE-02:41:31	ON-TIME
12hr PRODUCTS	01:36:06	01:49:45	COMPLETE-01:51:29	ON-TIME
24hr PRODUCTS	01:49:45	02:01:54	COMPLETE-02:03:40	ON-TIME
36hr PRODUCTS	02:01:50	02:12:21	COMPLETE-02:14:01	ON-TIME
48hr PRODUCTS	02:16:04	02:25:37	COMPLETE-02:27:27	ON-TIME
60hr PRODUCTS	02:24:58	02:34:24	COMPLETE-02:36:27	ON-TIME
72hr PRODUCTS	02:33:57	02:40:22	COMPLETE-02:42:11	ON-TIME
84hr PRODUCTS	02:38:59	02:47:32	COMPLETE-02:49:38	ON-TIME
NAM BUFR SOUNDINGS	01:33:52	02:52:02	COMPLETE-02:53:35	ON-TIME

00 UTC GFS

EVENT	Average Start Time	Average End Time	STATUS	COMMENTS
DATA DUMP AND PREP	02:46:04	02:55:09	COMPLETE-02:55:12	ON-TIME
ANALYSIS	02:55:17	03:18:37	COMPLETE-03:18:40	ON-TIME
T382 FORECAST F00-F180	03:18:45	04:25:57	COMPLETE-04:25:49	ON-TIME
T190 FORECAST F192-F384	04:26:01	04:39:29	COMPLETE-04:39:24	ON-TIME

The 00 UTC GFS cycle looks like this; scroll down to see the 06, 12, 18 UTC statuses.

00 UTC GFS

EVENT	Average Start Time	Average End Time	STATUS	COMMENTS
DATA DUMP AND PREP	02:46:04	02:55:09	COMPLETE-02:55:12	ON-TIME
ANALYSIS	02:55:17	03:18:37	COMPLETE-03:18:40	ON-TIME
T382 FORECAST F00-F180	03:18:45	04:25:57	COMPLETE-04:25:49	ON-TIME
T190 FORECAST F192-F384	04:26:01	04:39:29	COMPLETE-04:39:24	ON-TIME
12hr PRODUCTS	03:24:11	03:33:18	COMPLETE-03:33:07	ON-TIME
24hr PRODUCTS	03:30:35	03:36:47	COMPLETE-03:36:38	ON-TIME
36hr PRODUCTS	03:34:54	03:41:06	COMPLETE-03:41:17	ON-TIME
48hr PRODUCTS	03:38:37	03:44:52	COMPLETE-03:44:36	ON-TIME
60-72hr PRODUCTS	03:43:01	03:53:05	COMPLETE-03:53:00	ON-TIME
84-120hr PRODUCTS	03:51:12	04:12:31 Target=04:20:00	COMPLETE-04:11:35	ON-TIME
GFS MOS FORECAST	03:58:59	03:59:16	COMPLETE-03:59:02	ON-TIME

Studying these tables gives you an idea of the tempo and complexity of numerical weather prediction.

The GFS analysis for 00Z doesn't finish until ~01:22Z. NCEP waits for more data to roll in, and then creates the FNL analysis with the more complete data set. NCEP then runs the forecast out 6 hours using FNL as the starting point. That 6-hour forecast is used as the background field for the next GFS analysis at 06Z. The table uses these abbreviations:

NAM = North American Mesoscale
GFS = Global Forecast System
AVN = Aviation

If GFS is initialized at 2014-08-01_00, then it uses fnl_2014073118_06 as a background field before data assimilation. That means the FNL analysis cycle from 2014-07-31 at 18Z, but forecast out for 6 hours. That makes the file valid for 2014-08-01 at 00Z.

FNL is not on the table because it is not disseminated as an operational product (in the sense that it is available 24x7, in real-time, without data drops).

In summary, the FNL analysis incorporates ~10% more observational data than the GFS analysis at the cost of a 60-90 minutes delay.

As an archive, the RDA is interested in offering the most realistic atmospheric analysis, not the timeliest one. Users shouldn't come to an archive for timely data--they should come for the most complete and accurate data possible. We only archive the analysis FNL file--those that end in _00. The forecast ones end in _HH for the number of hours from model initiation. "Real-time" users can get the FNL analysis grids directly from NCEP's NOMADS server, http://nomads.ncep.noaa.gov/.

To learn more, read http://rda.ucar.edu/datasets/ds083.2/docs/Analysis.pdf

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Atmospheric & Geoscience Research Data Archive
Computational & Information Systems Laboratory
National Center for Atmospheric Research
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