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IT WAS ONLY A GUESS...

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As computer power increases at seemingly exponential rates, and numerical weather prediction (NWP) models become more sophisticated and generally more reliable, forecasters are becoming more and more dependent on the guidance produced by these models. It is therefore imperative that the operational forecaster understand model characteristics and input in order to make educated judgments about model output. This process includes being able to decide when and how the model is erring in a particular run. The importance of the process became crystal clear on November 6, 1986.

On this date, field forecasters encountered an unusual situation with respect to the 12Z LFM, NGM, and AVN model runs. Figures 1a-c show the initial height and vorticity fields at 12Z for each of the three models. A major problem is apparent in the NGM and AVN analyses as a deep low is analyzed between 40/50N and 145W -- nearly the same location where the LFM had correctly analyzed a strong upper high center. NMCADMNFD messages attributed the problem to a bad first guess contaminating the NGM and AVN forecasts.

At first glance, this seemed unlikely since Technical Procedures Bulletin 355 states that output from the GDAS (Global Data Assimilation System) 6-hour forecast is used as a first guess for all of the models. However, communication with NMC revealed that this is only true to an extent. Since the various models require data with different horizontal and vertical resolutions, GDAS output is transformed into both SIGMA and PRESSURE coordinate data. The LFM uses the SIGMA data, while the other models incorporate the GDAS PRESSURE level output as first guess fields in their analysis (00 hour forecast) schemes.

When computer problems exist at NMC, a series of backup systems are implemented which allow the models to be run. The 00Z November 6 GDAS was run in such a backup mode. An apparent "glitch" was encountered in retrieving the GDAS PRESSURE level data, and the appropriate file was not updated correctly. The SIGMA output file was apparently unaffected. This problem was not discovered until after the 12Z model runs were well underway. It appears that the pressure level fields from a week earlier were retrieved by the computer and used in the NGM and AVN analyses.

Since the first guess is used as a method of quality control for the observed data, GOOD data in the western half of the U.S. and the eastern Pacific were thrown out as they were too far out of sync with the first guess field. Since the downstream features remained quite similar on both the correct and tainted analyses, the downstream pattern must have been fairly similar to that of November 6, and the observed data were kept. If one looks at the 36 hour forecast generated by the LFM and the NGM (Figs. 3a and b) they are strikingly similar. This implies that the pattern in the central Pacific, upstream of the bad analysis region, generally resembled that of November 6, and the data in this area was also incorporated into the model analyses.

Although the problem described above was apparently a rare and quite obvious one, the models often incorporate more subtle errors in the observed data into their forecasts. It is these cases which may only be identified by operational hand analysis of surface and upper air data, and interpretation of satellite imagery. Since public forecasts are made both through knowledge of current observed weather, and interpretation of guidance products, a critical quality control of the observed data is necessary. Guidance products can only then be more critically and correctly interpreted as to their quality and usefulness in a given situation. You never know when a guess is not just a guess!

Fig. 1a

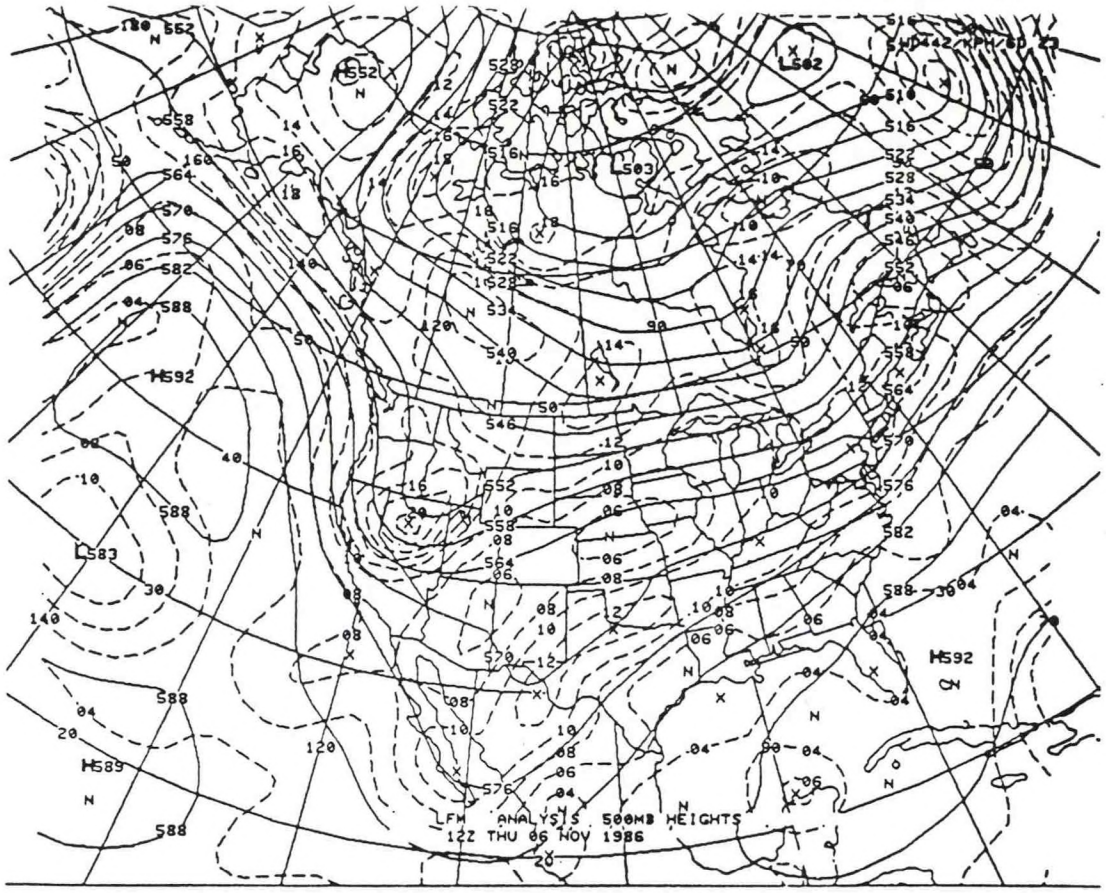


Fig. 1b

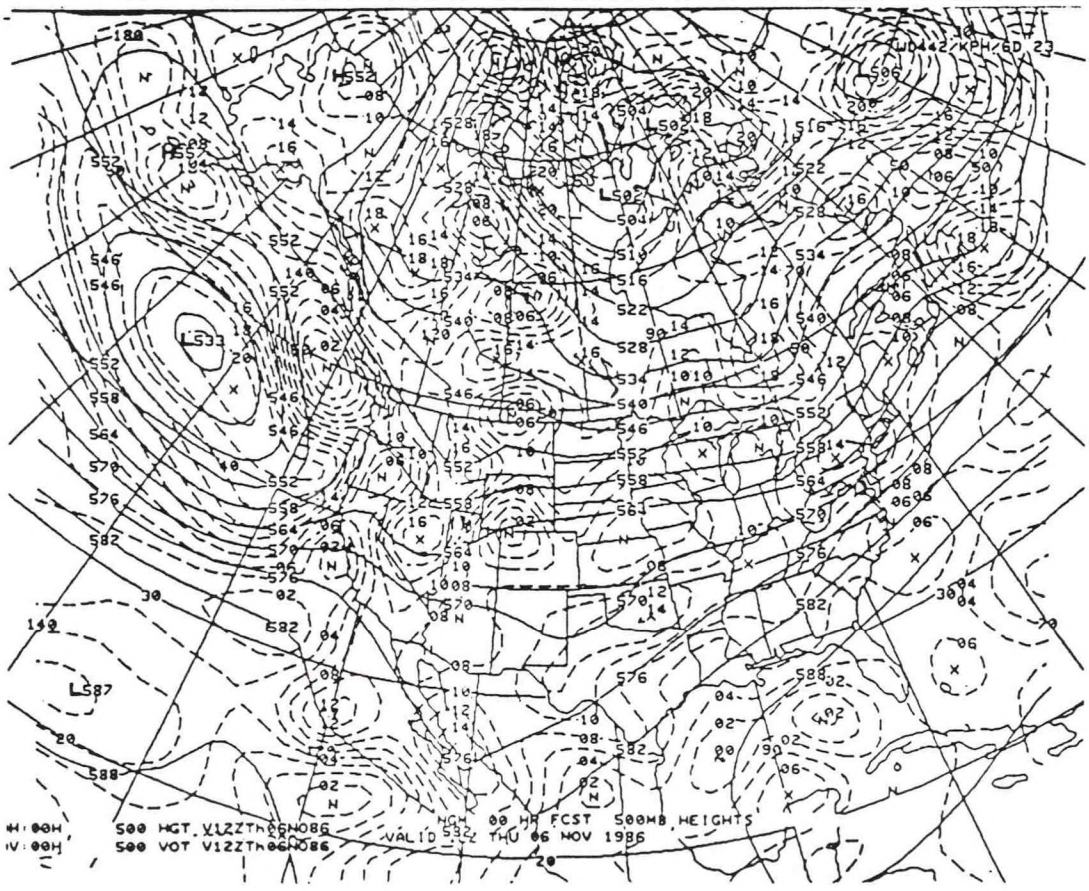
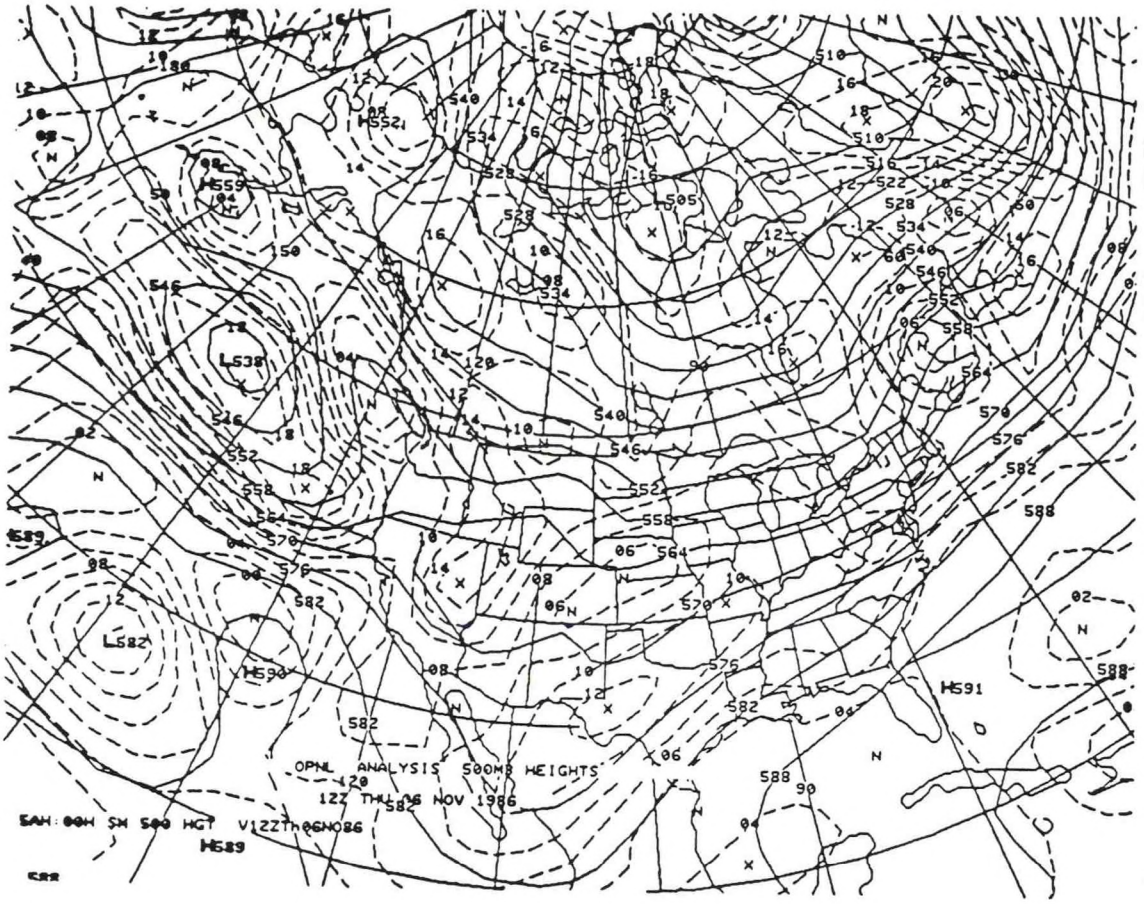


Figure 1. Initial 500 mb height/vorticity analyses for 12Z 06 November 1986; a) for LFM, b) for NGM, and c) for AVN.

Fig 1c



ZCZC NMCADMNFD
ADMN9 RWRA 061645

SPECIAL NMC DISCUSSION

0616452 THE 12Z NGM RUN THIS MRNG IS CONTAMINATED BY A BAD GUESS FIELD AND THE FCST OUTPUT SHUD NOT BE USED. 12Z LFM FCST OUTPUT HOWEVER WAS NOT AFFECTED AND SHUD BE OK...BUREK...NMC

ZCZC NMCADMNFD
ADMN9 RWRA 061815

SPECIAL NMC DISCUSSION

0618152 IT HAS NOW BECOME PAINFULLY OBVIOUS THAT THE 12Z SM RUN SUFFERS FROM THE SAME BAD GUESS AS THE NGM DOES. WE WILL ATTEMPT TO RERUN BOTH THE 12Z NGM AND SM CYCLES WITH A CORRECT GUESS BUT THIS MAY TAKE AWHILE AS WE HAVE TO START FROM SCRATCH. IN THE MEANWHILE ADVISE USING UNCONTAMINATED 12Z LFM OUTPUT. ALSO AFOS PIL SAH IS BAD...BUREK...NMC

Figure 2. NMCADMNFD messages issued at 1645Z and 1815Z 06 November 1986.

Fig. 3a

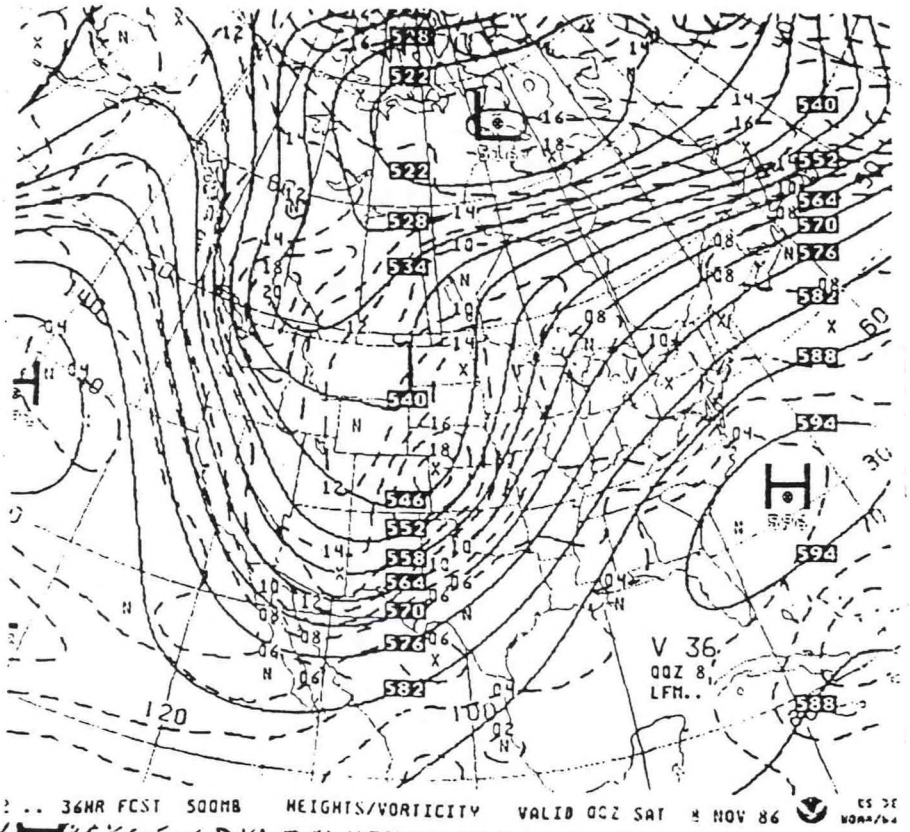


Fig. 3b

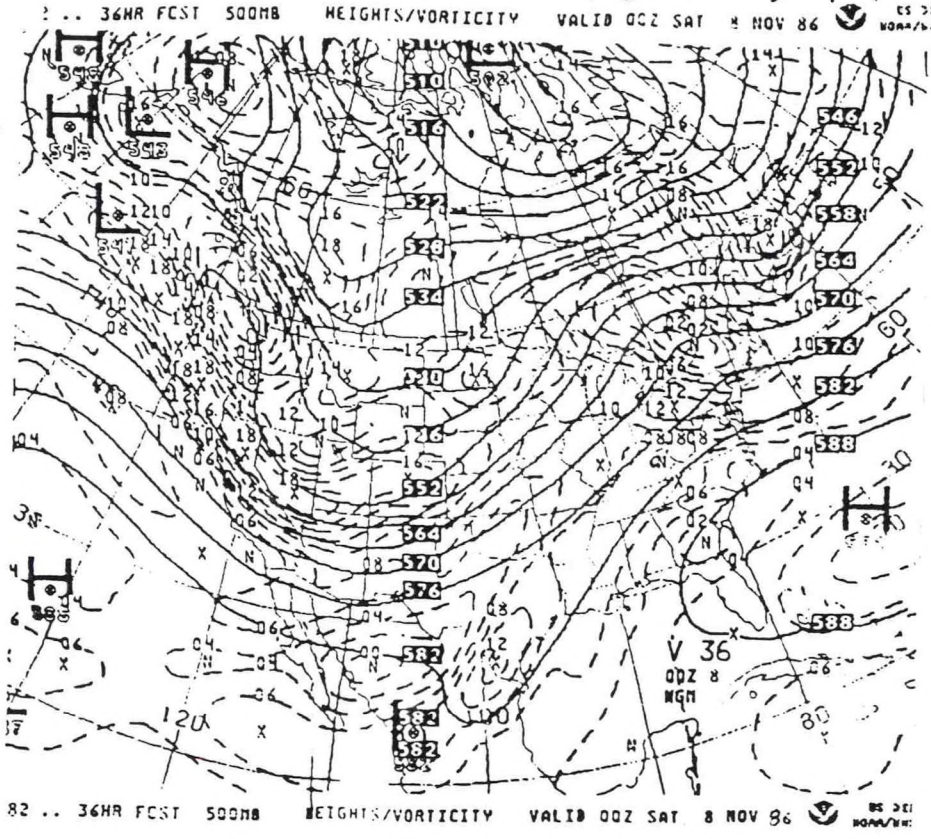


Figure 3. 36 Hr 500 mb height/vorticity forecasts valid 00Z 08 November 1986; a) for LFM, and b) for NGM.