Western Region Technical Attachment
No. 93-21
July 27, 1993

THE IMPORTANCE OF COMPARING DATA AND THE MODEL ANALYSIS

Keith Meier - Western Region Scientific Services Division

Introduction

A significant problem, which can invalidate a model run, is bad data contaminating a model analysis. Typically, bad upper-air data is detected by quality control procedures at the National Meteorological Center (NMC) and deleted before being used by a particular model. However, bad data will occasionally be undetected by the quality control procedures, and subsequently be incorporated into a model analysis. Once the data is input into the model, the model views the data as being correct. A brief example of an egregious data error which influenced a recent model run will be discussed.

Example

The 500 mb data analysis from 1200 UTC 21 July 1993 (Fig. 1) clearly displayed an incorrect wind report from Winslow, Arizona (INW). The INW sounding for that morning (Fig. 2) showed that winds at all levels had an easterly component. The temperature and dew point reports from the sounding appeared to be very reasonable. When comparing the wind report from INW at 500 mb with surrounding wind reports and the geostrophic wind (inferred from the height field), it appears as if the wind report would be correct by simply veering the wind by 90°. In this particular situation, the model analysis over the western United States was very important as numerous upper-level shortwaves had been, and were anticipated to, rotate through the large-scale trough over the area. As the first model run of that morning became available (the Eta model), it was quickly apparent that the Eta model had become influenced by the bad wind reports throughout the upper-air sounding at INW.

The 00 h analysis of 500 mb heights and vorticity (Fig. 3a) depicted a vorticity maximum on the order of 16×10^{-5} s^{-1} over southern Arizona. In comparison, the NGM 00 h analysis of 500 mb heights and vorticity (Fig. 3b) did not identify a vorticity maximum over Arizona, but instead located one over the extreme southern Nevada and southern California. In order to decide which analysis was more accurate either satellite imagery or the actual data analysis could have been used. In this particular case, satellite imagery was not as useful in defining the position of the shortwave. After careful examination of the upper-air data over this area, it was apparent that within the Eta model the shortwave location over Arizona was erroneous and in response to the bad wind reports at Winslow. In fact, this error was significant enough that the true shortwave location over southeastern California was essentially unrepresented within the Eta model.

Conclusion

With the amount of available forecast information steadily increasing, it becomes even more important to carefully examine the information and reconcile it with actual observations, whether it be satellite imagery, surface data, or upper-air data. In many cases, the peculiarities of a particular model run may be in response to a misanalyzed feature or purely bad data.

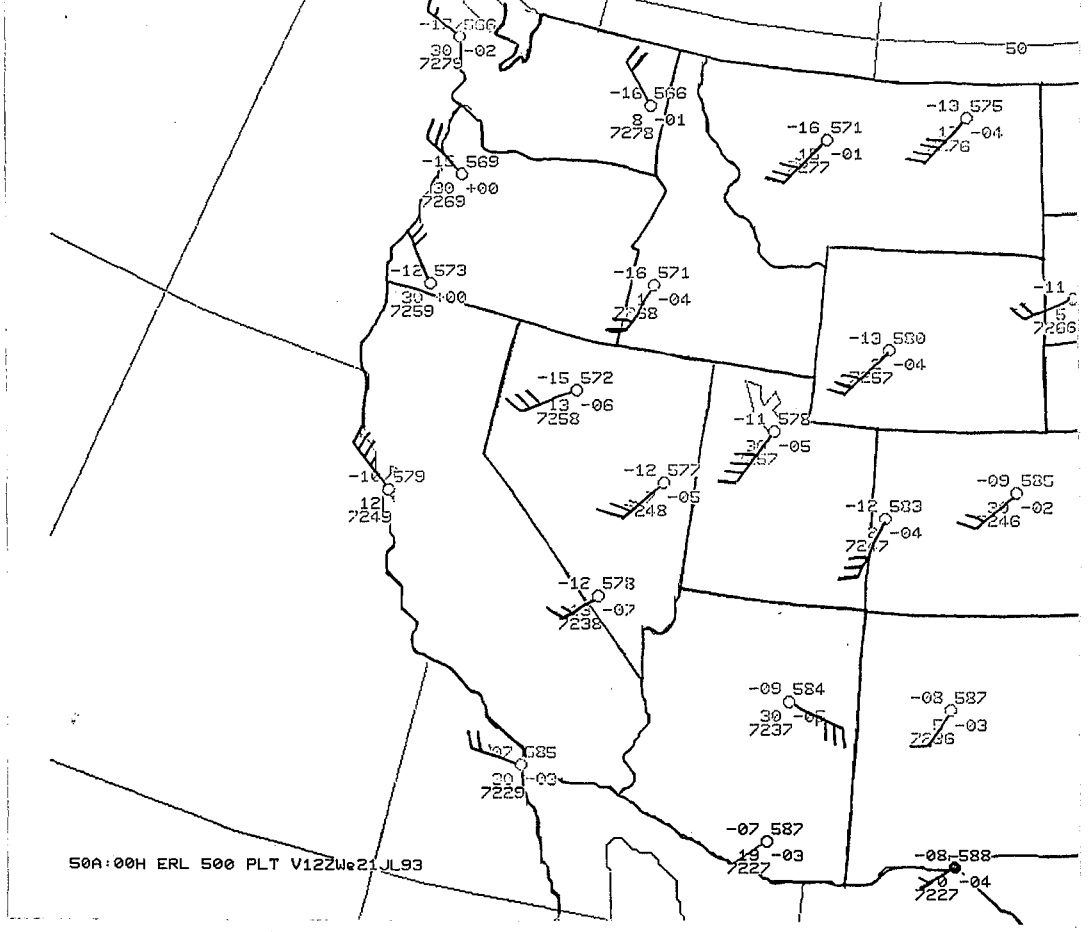

Fig. 1 500 mb analysis at 1200 UTC 21 July 1993.

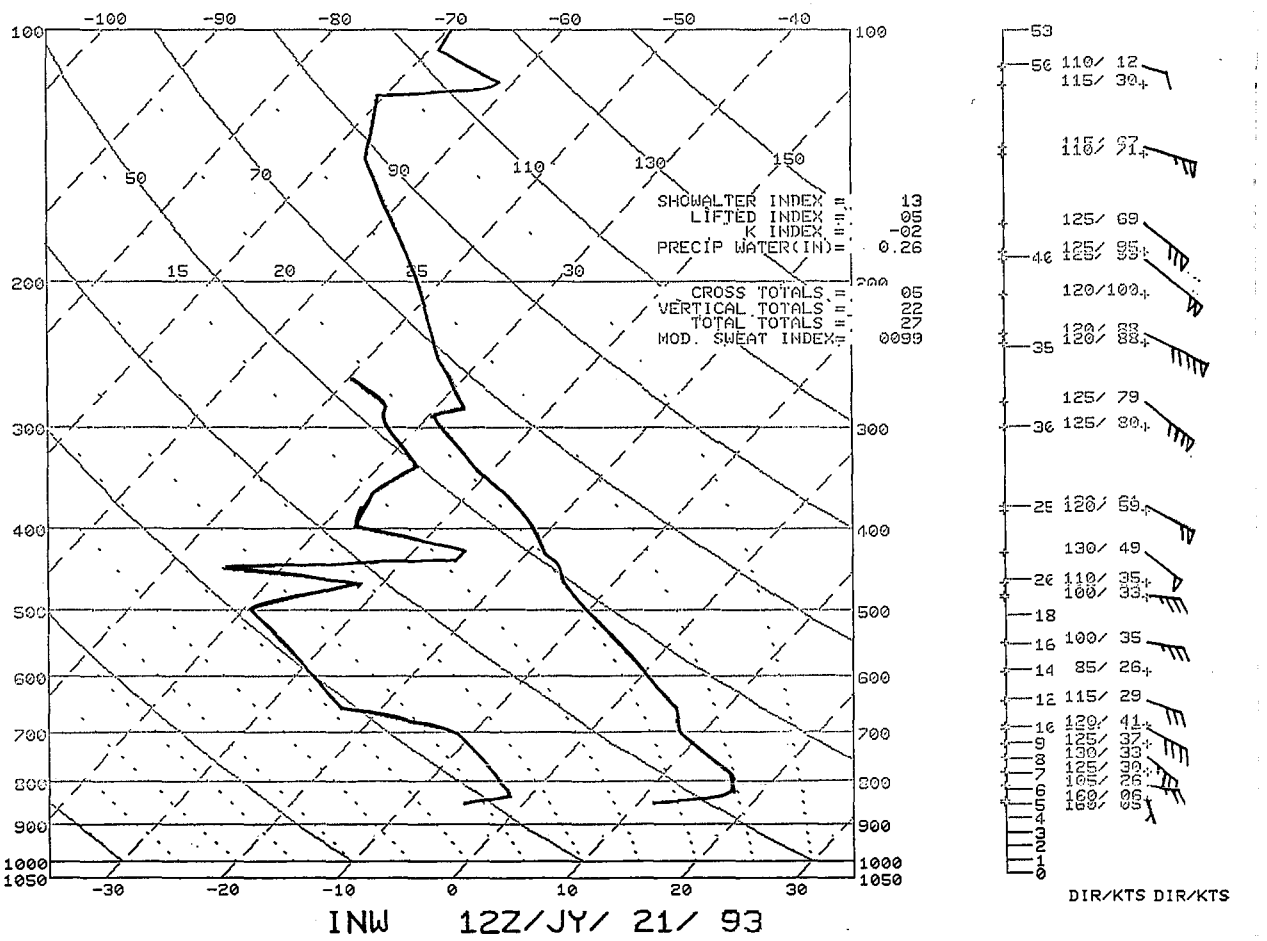

Fig. 2 Upper-air sounding from Winslow, Arizona (INW) at 1200 UTC 21 July 1993.

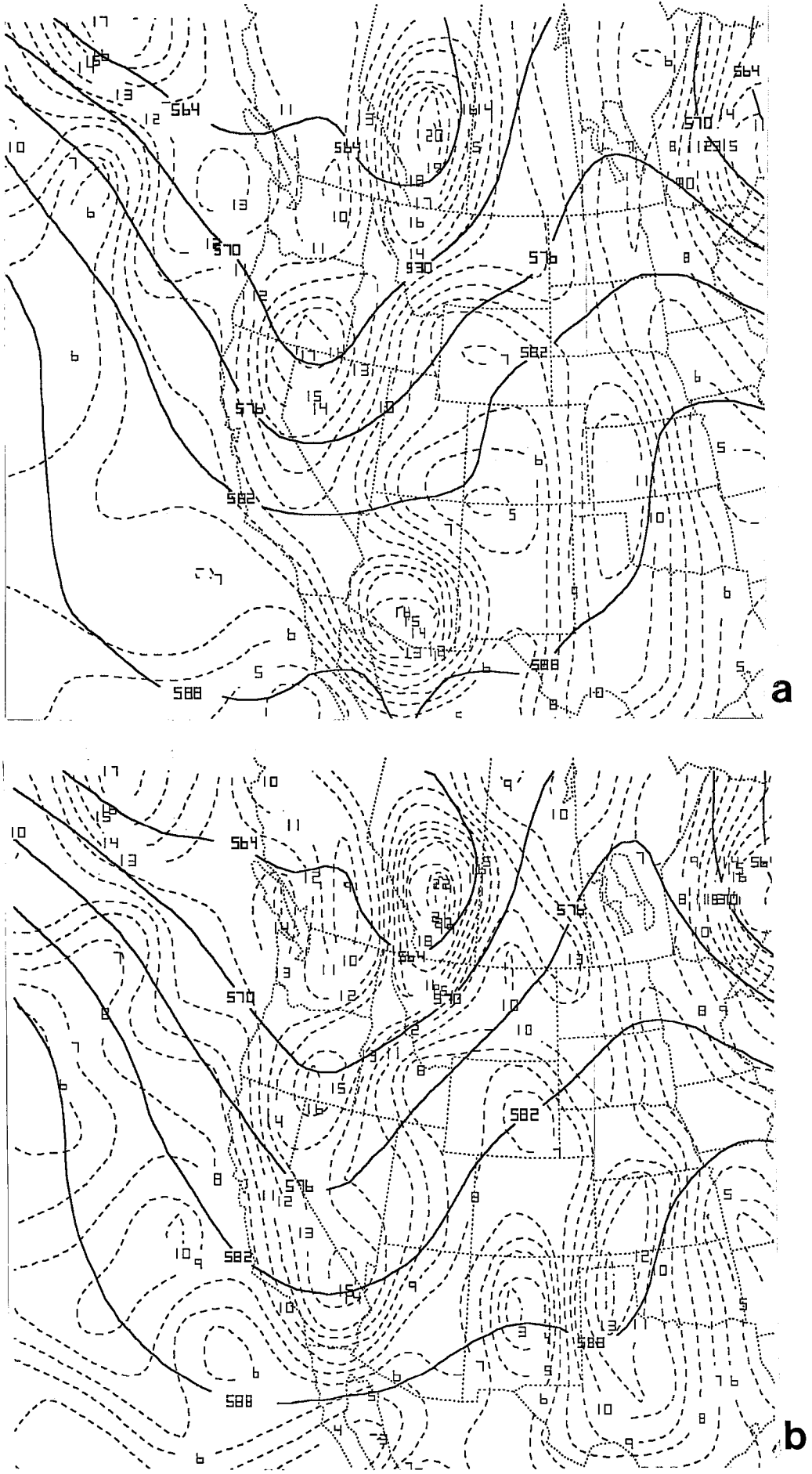

Fig. 3 500 mb heights (every 60 m) and absolute vorticity (every $1x10^{-5}$ s^{-1}) for 00 h analysis valid 1200 UTC 21 July 1993 from the a) Eta model and b) NGM.