



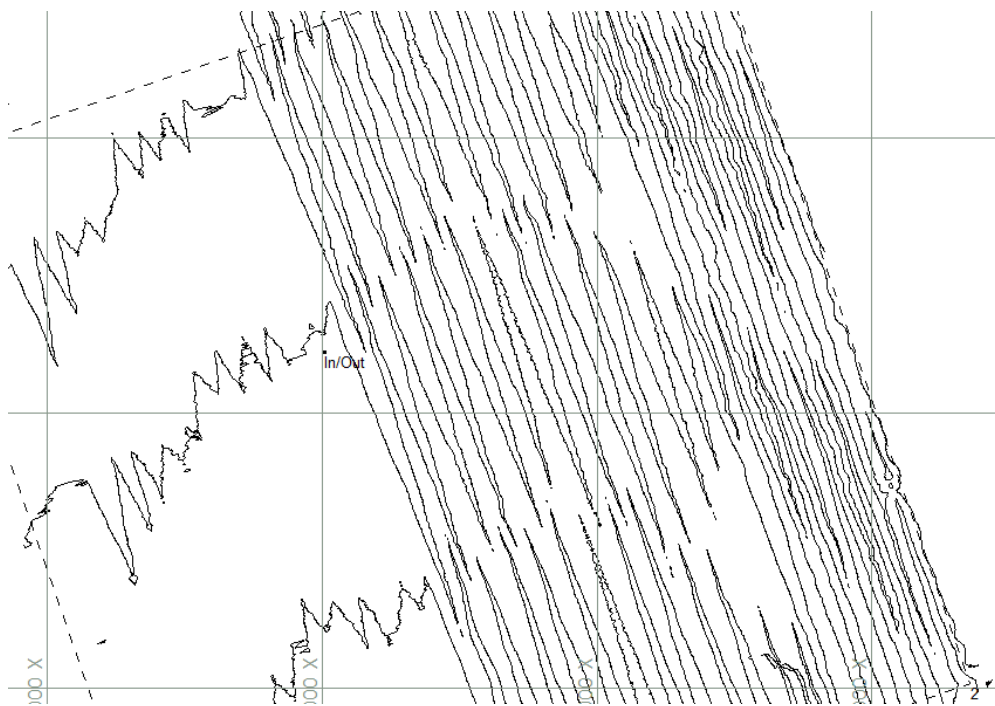
A Dramatic Example of Diurnal Effect in Magnetometer Surveys

By Jerry Knisley

With the latest advances in the SINGLE BEAM EDITOR relating to magnetometer surveys to help enhance contour and remove diurnal effect it was coincidental that a surveyor I know was doing a survey with a magnetometer and asked what I thought was wrong with this data. He thought it could be diurnal effect.

Figure 1 shows a DXF contour generated from lines that were run over a two day period. This is a perfect example because instead of running every line out in order they ran every other line to cover the entire area in case they had bad weather on the second day. With good weather they came back and ran the missing lines. If the data is processed together the diurnal effect becomes quite apparent.

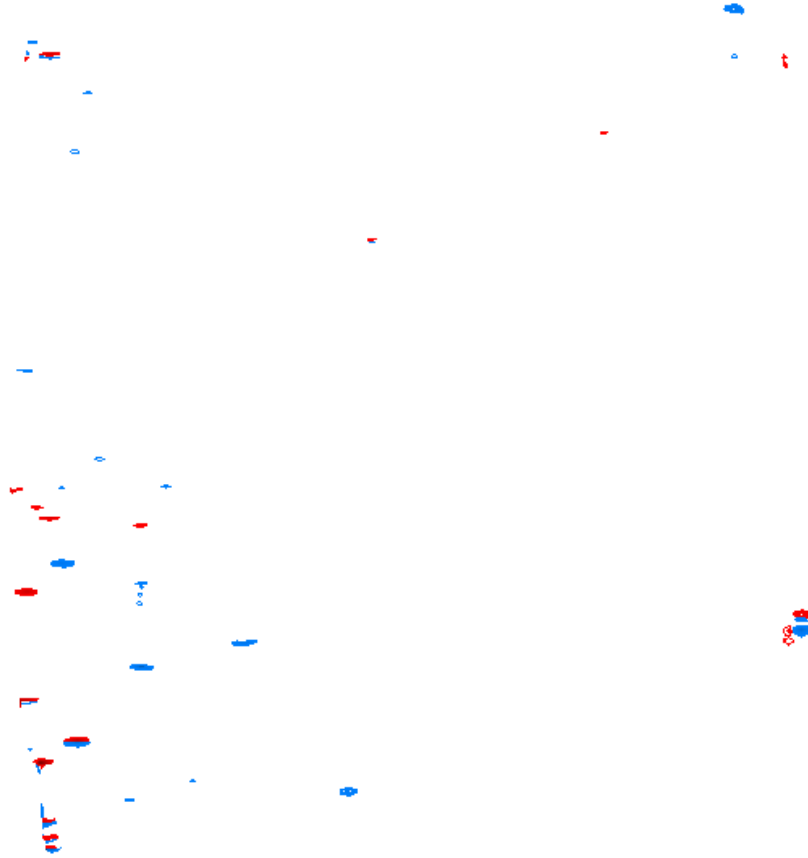
FIGURE 1. *Magnetometer Contours*



The gamma contours in the right half of the picture show a 2000 foot shift in position from one line to the next. The gamma shifts to the left half of the image show a shift of 250 feet. I was confused by this at first. Once I analyzed the contours one day at a time, I noticed that the area to the left was surveyed all in one day but was surveyed in the morning skipping every other line. Later that day, the surveyor had time so they came back and started to fill in the gaps. The diurnal effect increased as the day went on. The next day the diurnal effect was much worse, that's why the right half has such a large shift in the contour location.

I processed the data using the method where the gamma reading is copied from depth 1 to depth 2, the targets are removed from depth 2 and then depth 2 is subtracted from depth 1. This method removed the diurnal effect. I processed the targets and created a contour map of the targets that are left behind.

FIGURE 2. Diurnal Targets



This image shows the targets that are left behind. By ignoring the diurnal effect and processing the data in this manner, we are able to remove any effect it had on the targets. My personal preference is to save the targets out as negative gammas in red and positive gammas in blue. I remove the gammas at -0.5 to 0.5 by making those contours white.

There are many tools in the software now to assist in the processing of magnetometer data including bringing in the IGRF background gamma per reading and using an external reference station as a tide to remove diurnal effect. This survey is one of the worst cases of diurnal effect that I have ever seen. The best method of removing the diurnal effect was to process the survey as I explained above. I was not able to show the background gamma's but I was able to show the targets clearly.