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# Site Characterization for Monitoring Applications

Magnetometers and gradiometers are being used increasingly in monitoring roles (i.e. to monitor atmospheric magnetic disturbances, volcanoes or earthquakes). In this context, one of the prime goals is to ensure that sensors used for measurements are situated in locations that are as magnetically quiet as possible.

This is typically done with a magnetometer or gradiometer ground survey. The corresponding data in this short report are taken from Oaxaca, Mexico where the company installed a SuperGradiometer for earthquake prediction applications.

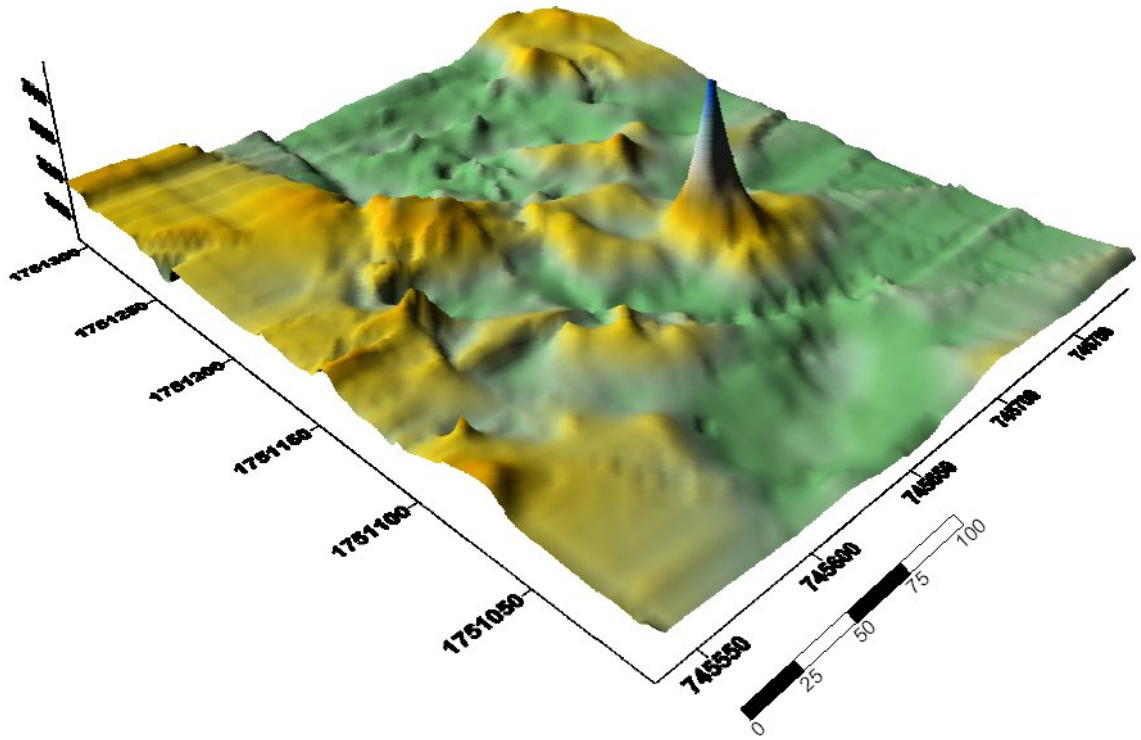


Figure 1: Site characterization map derived from Overhauser gradiometer (0.5 second sampling) for Oaxaca site. The site is characterized by a magnetically active western portion which grades into a peak anomaly to the east. The north-central and southwestern areas are quiet … this is where monitoring  sensors were placed.

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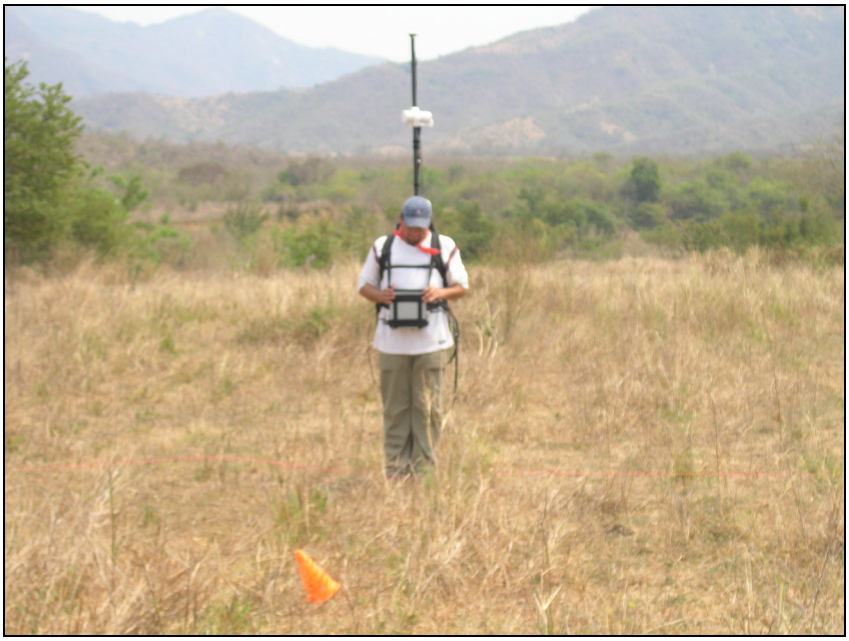
CLICK ON THE FIRST IMAGE BELOW TO
SEE VIDEO OF THESE SURVEYS IN ACTION

Figures 2 and 3: Acquisition of gradiometer data on site in southeastern Mexico.



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## *Survey Data and Methodology*

The survey data represent gradiometer data obtained using a GPS and "Walking" survey mode. The operator simply walked roughly N/S lines for as much of the grid as possible. Where there were obstacles or areas that needed detailing, the operator took a zig-zag route, mostly comprising E/W lines. The image below shows the GPS survey path.

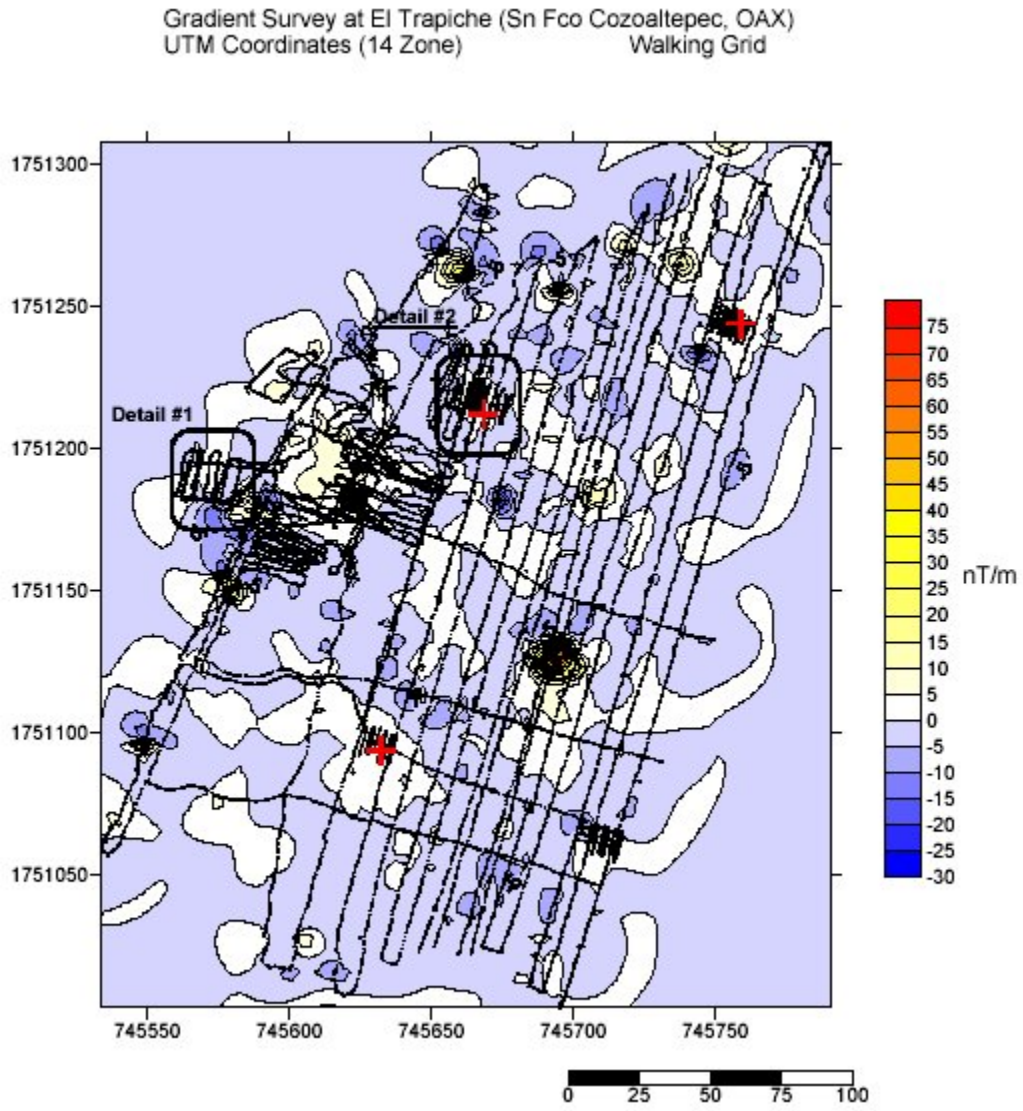


Figure 4. GPS survey path showing extent of coverage and detail areas.

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The image below shows the resulting data that were obtained with three crosses indicating the desired location for monitoring sensors (i.e. based on the data). The objective of the survey was to locate sensors in areas with approximately zero gradient; this result shows that the objective was achieved.

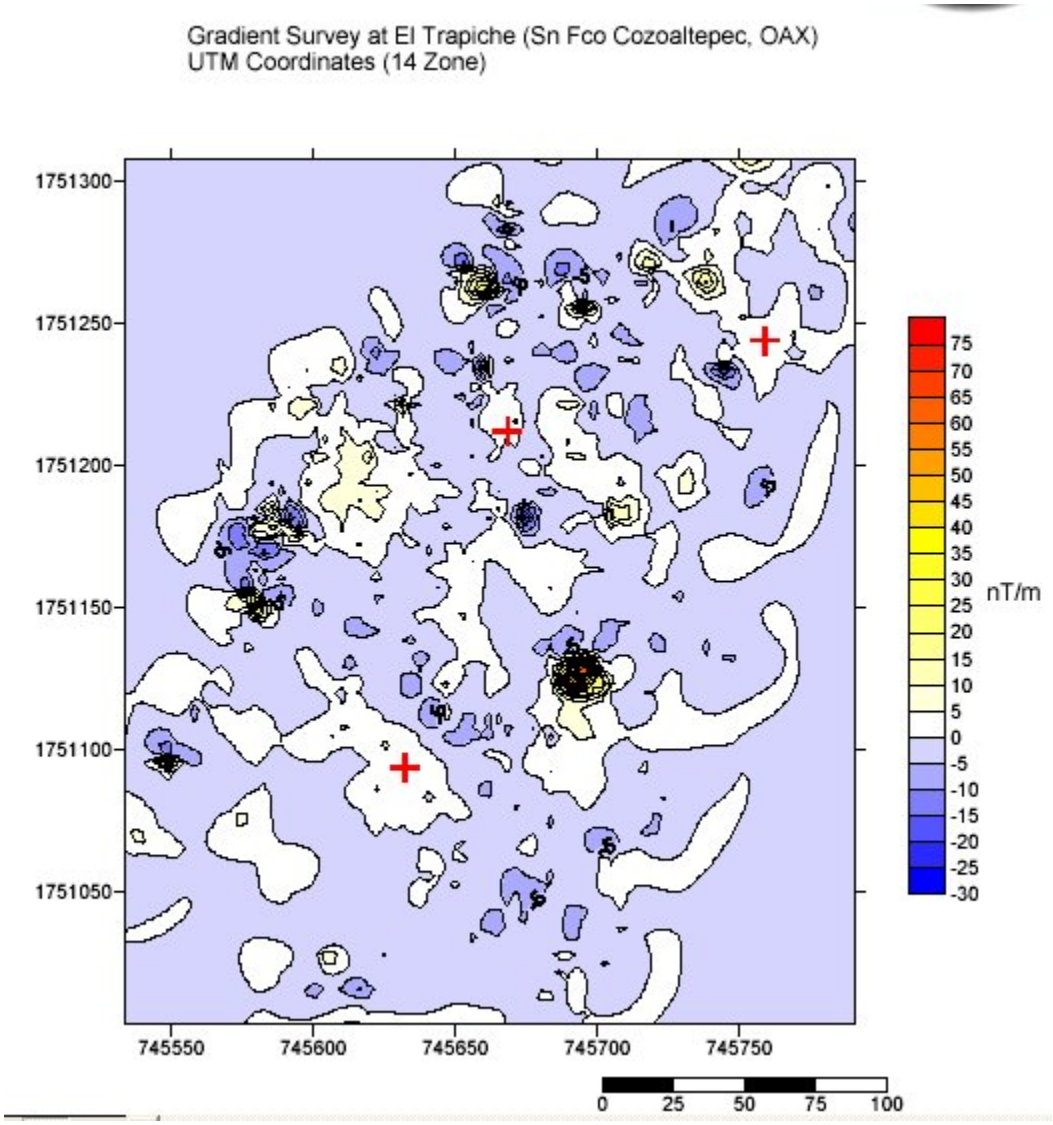


Figure 5: Sensor placement locations. Monitoring sensors were placed at each of the crosses in the figure above.

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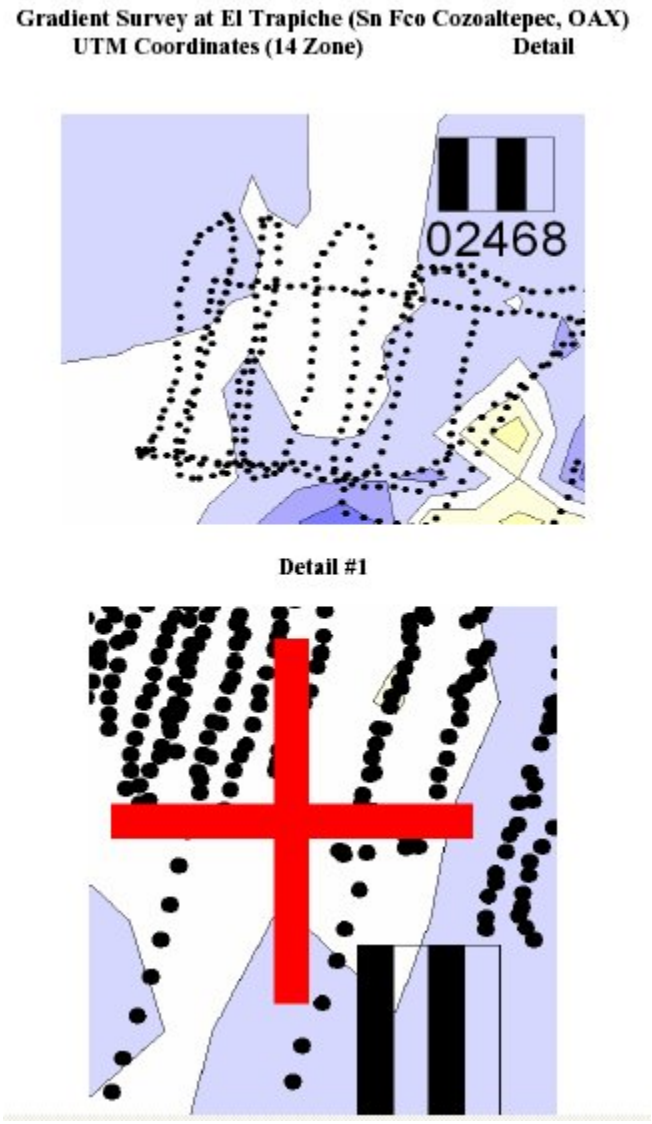


Figure 6: Detail survey path superimposed over gradiometer anomalies.

As shown in Figure 4, detailed data were acquired at several locations in the Oaxaca field site. These detail areas were defined after plotting the main data … detail areas were to follow up on areas that looked to be magnetically quiet and suitable for installation of monitoring sensors.

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## *Interpretation*

There were many anomalies in the area; particularly to the west and central areas of the survey coverage. The general geology is a sedimentary basin with much transported presumably magnetic material (i.e. boulders which are evident at surface). Therefore, it is thought that the magnetic highs are mapping near surface boulders (potentially granite from nearby provenance areas).

All sensors were placed in the quietest areas feasible away from obvious boulders … both visible at surface and from the gradiometer data.

## *Conclusions*

Gradiometric mapping represents an important step in preparing sites for monitoring functions (observatory, volcanoes and earthquakes). With the Overhauser gradiometer, this type of application can be performed very quickly and accurately using GPS functions available to the operator. Ultimately, this mapping led to ideal positioning of sensors within the area of operation determined by the customer on this project.