**A Geometric Survey in Santee, California**

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# Abstract

Magnetic anomaly modeling is a very useful tool in the geologic inquiry process. It is most effective when used in conjunction with other scientific disciplines such as field geology. One must have a good understanding of the geomagnetic field in order to use it properly. Knowing how the rotation of the earth generates a magnetic field in its core is key to understanding it's dipole character. The inclination, declination and intensity of the geomagnetic field **($B_E$)** directly effect the induced magnetization of magnetically susceptibly rocks. The induced magnetization and the remnant magnetization add together to produce magnetic anomalies.

Magnetic anomalies were calculated in a field test site in Santee, CA. The total magnetic field **($B_T$)** was recorded using a cesium vapor magnetometer. The geomagnetic field, $B_E$ was then subtracted out using this equation: $\Delta B = |B_T| - |B_E|$ to reveal the magnetic anomaly. The data were then modeled in order to estimate the cause of the magnetic anomalies in the subsurface. Broad, local anomalies in the study were created by lithology differences in the rocks. Anomalies were also caused by induction of the geomagnetic field in objects on the surface. Small anomalies, created by erosional and sedimentary processes were also found. The qualitative results of this study are as follows.

The geomagnetic field induced a current into a piece of rebar that was on the ground at the test site. The rebar emitted an anomaly pattern that was recorded by the magnetometer. The pattern had a large magnitude from peak to trough and a very steep slope. The large magnitude spike pattern represents the large magnetic susceptibility contrast between the rebar and the host rock, and its steep slope represents it's close proximity to the surface. This spike anomaly rests on top of a broad, regional anomaly. This anomaly appears to be a result of varying concentration of

magnetite grains in the host rock. Studying the aeromagnetic data of the region highlights the vast anomaly created by the magnetite rich western Peninsular Range Batholiths compared with the magnetite poor eastern Peninsular Range Batholiths. Locating the latitude and longitude coordinates of the Santee test site on the aeromagnetic anomaly map for San Diego County supports the findings of a decrease in field strength from east to west.