Terrain Derivative Computation in Potential Field Interpretation

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Methods based on Gravity Gradient Tensor (GGT), and on its related quantities, such as horizontal gradient or Euler deconvolution are in great development. Their interpretation allows a high resolution and non-invasive investigation of the Earth's subsurface. GGT components may be either measured or numerically calculated from Bouguer anomaly data. Numerical algorithms to compute the GGT components are straightforward if gravity data are acquired over an approximately flat topography. When the data are instead acquired over a rugged terrain, false GGT anomalies may be created, due to the topography. This because such algorithms are based on the assumption that the measurements are referred to a flat level. To avoid those problems we propose a strategy called "Terrain Derivative Computation" (TDC).

It consists of:

a) upward continuing the data to a flat level,
b) compute gradients there
c) downward continuing the gradient to the topography surface.

The Terrain Derivatives Computation (TDC) would allow more accuracy computation, avoiding most of errors due to topography. In particular horizontal gradient or gravity gradient components exhibit interesting source features, which are instead distorted.

This methodology was first applied to synthetic data and then to a real case where it helps to reveal details of the subsurface geometry of faults and basin architecture which are not evident in the subsurface geology.