

## INTRODUCTION

When working with ground gravity data it is important to understand that the instruments are relative measurement instruments and not absolute measurement instruments. There are absolute instruments but due to their cost, they are used in a stationary location to provide a reference measurement that allows the relative data to be adjusted when taking a measurement at the absolute station. Most ground instruments use some type of spring either metal or glass. These types of instruments naturally drift during a day and across days.

## DRIFT CORRECTIONS

There are no hard and fast rules for what measurements are taken to correct for drift. Every experienced surveyor has their own preferred techniques. However, some basic principles can be commented upon.

First, in regard to drift loops: These are a series of measurements taken over a short time interval which loop back on the start measurement. Traditionally, the difference between the start and end measurement is the drift of the loop and all measurements in the loop are corrected by linear interpolation utilizing the time interval. These loops are carried out several times each day for each instrument in the survey. Second, in regard to daily drift: Typically, each instrument takes a measurement at a base station at the beginning and end of each day. The determined drift must then be correct through all measurements during the day. Third, in regard to drifts across days: For a small survey, one or several base stations are set up and measurements are taken at the beginning of each day at each base station and the daily instrument drifts determined from these repeats. If an absolute station is available, then daily measurements are taken by each instrument at the location of the base station.

## LATITUDE DEPENDENT CORRECTIONS

All of these corrections produce a new channel with the applicable correction for the data. The user must apply these corrections to the drift corrected data.

The theoretical latitude correction is a correction for the effect of elliptical model of the earth using the latest value for the average density of the earth. In present days, the earth is monitored for gravitational fields via satellite and thus there are relatively frequent updates to the parameters for this correction. We keep ourselves apprised when new parameters are released up and upgrade the software accordingly. Tidal corrections are due to variations in the tides and the correction is dependent upon latitude, longitude, elevation, date and time. The default gravitational constant is updated as available.

The free air correction is the correction for the distance from the earth centre using the present average density of the earth. It is dependent upon the stations latitude and elevation. The atmospheric correction is a very fine correction to apply the gravitation effects of the atmosphere. The Bullard corrections for a slab assume a flat earth while the spherical cap introduces the geometry of the ellipse into this correction. Topographic corrections in QCTool correct for the imperfections of these two approximates for the actual topography. These corrections require the use of digital elevation models (DEM). Today, the best source of these models is the NASA satellite models.

In QCTool, one can avoid the Bouguer slab correction by going directly to a full topographic correction. Select the Continuous Surface Topography under the Terrain Correction from a Grid and select the Full Terrain option.

However, if the survey is in areas of significant topography it is recommended when interpreting in EMIGMA to stop the corrections at Free Air and to incorporate the topography in modeling or inversion. The EMIGMA inversions allow the use to the topographic models in the inversions thus allowing for the inversion to have a variable density which while improving the inversions also allows for detection of anomalies within the topography. The EMIGMA inversion application allows for utilizing the DEM model derived from the GPS Z measurement and the altimeter measurement ( Z channel) or incorporating a DEM polyhedral model but importing this model from DEM grid (utilizing the PolyGenerator tool).