SnT 2023
CTBT: SCIENCE AND TECHNOLOGY CONFERENCE
HOFBURG PALACE - Vienna and Online
19 TO 23 JUNE

lightning Talks
P1.2-523

Gravimetric investigation of geological structural anomalies

Nishath Ranasinghe, Charlotte Rowe

Earth and Environmental Sciences, Los Alamos National Laboratory, Los Alamos, NM, U.S.A. (LA-UR-23-24981)

Introduction

- Gravity data were acquired at two different locations on the Nevada National Security Site (NNSS) in southern Nevada, U.S.

- Aqueduct Mesa in the northwest portion of the NNSS, where extensive tunnels have been mined and used for underground explosions.

- Our goal is to compare the observations to predictions from a 3D density model, to ascertain **whether underground cavities can be detected using gravimetry**.

- Rock Valley site in the southern part of the site exhibits numerous faults and is a source of frequent seismicity; the site is the targeted for an experiment (RVDC) to compare explosion and earthquake signals to improve source characterization.

- The site characterization using gravimetric methods may validate geologic and seismic models of the target area.

Data and Methods

- Gravimetric data collected at the Aqueduct Mesa and Rock Valley Site are corrected for elevation, latitude, instrumental drift, tidal oscillations and mid-survey dial adjustments.

- GFM and DEM have been utilized to convert 3-D density models which will provide Bouguer and Terrain corrections and result in a Bouguer anomaly map.
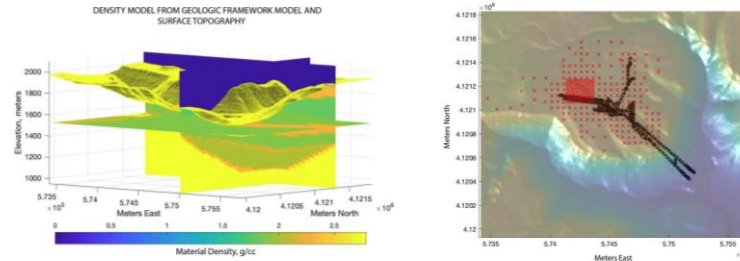

3D density model for Aqueduct Mesa derived from GFM.

Map of acquired gravity readings at the Mesa.

- Forward modeling uses a grid of right rectangular prisms with associated densities based on Nagy (1966).

- SimPEG software is also used for forward and inverse modeling of the gravimetric measurements.
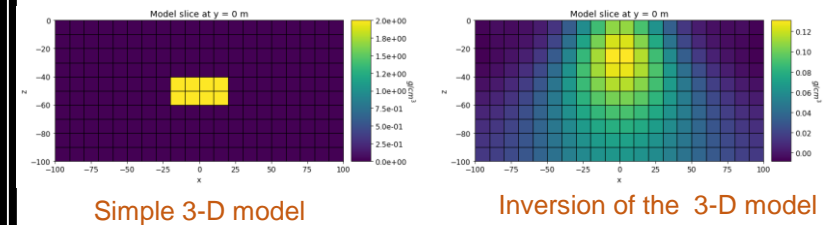
Results and Conclusions

Forward modeling at the Aqueduct Mesa Site
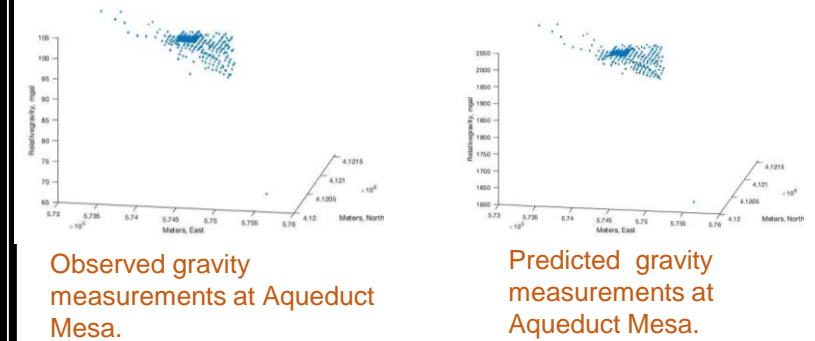
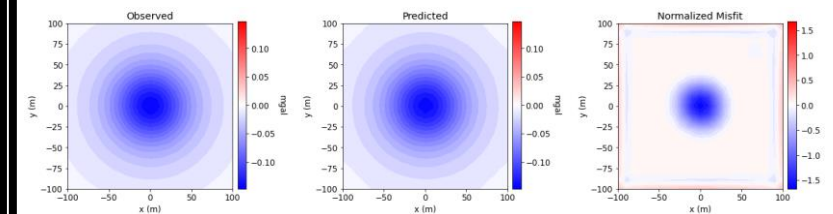Observed gravity measurements at Aqueduct Mesa.

Predicted gravity measurements at Aqueduct Mesa.

Forward and Inverse modeling of a simple model using SimPEG software

Simple 3-D model

Inversion of the 3-D model

The difference between the observed and inverted models