## (a)

We find the following relation between $D$ ,$(x - \xi)$ and $\theta$:

$cos\theta = \frac{D}{(D^2 + (x-\xi)^2)^{1/2}}$   $sin\theta = \frac{(x-\xi)}{(D^2 + (x-\xi)^2)^{1/2}}$

The directional vector: $\hat{r} = \begin{bmatrix} cos\theta \\ sin\theta \end{bmatrix}$

$$\Delta F = \begin{bmatrix} M\Delta g_z \\ M\Delta g_x \end{bmatrix} = \frac{GM\Delta m}{r^2}\hat{r} = \frac{GM\Delta m}{D^2 + (x-\xi)^2} \begin{bmatrix} cos\theta \\ sin\theta \end{bmatrix} = \begin{bmatrix} \frac{GM\Delta m D}{(D^2 + (x-\xi)^2)^{3/2}} \\ \frac{GM\Delta m (x-\xi)}{(D^2 + (x-\xi)^2)^{3/2}} \end{bmatrix}$$

so $\Delta g_z = \frac{G\Delta m D}{(D^2 + (x-\xi)^2)^{3/2}}$

## (b)

Because the anomalies are at 0.1 meter intervals from 0 to 10, we consider the k anomaly:

$\xi = 0.1(k-1)$

$g(x, \Delta m_k) = \frac{GD\Delta m_k}{[D^2 + (x - 0.1(k-1))^2]^{3/2}}$

so the total contribution of all anomalies can be calculated as

$g(x, m) = \sum\limits_{k=1}^{101} \frac{GD\Delta m_k}{[D^2 + (x - 0.1(k-1))^2]^{3/2}}$   where $m = [\Delta m_1 \Delta m_2 ... \Delta m_{101}]'$

## (c)

Linear. Because the model predication is a linear function of $m$:

$$d_i \quad = \quad G_{i,:}m$$

where

$$G_{ij} \quad = \quad \frac{GD}{[D^2 + (x_i - 0.1 \cdot (j-1))^2]^{3/2}}$$

## (d)

## (e)

We see that the inversion result is messy. To understand it, we calculate the singular values, and plot them in logarithm.
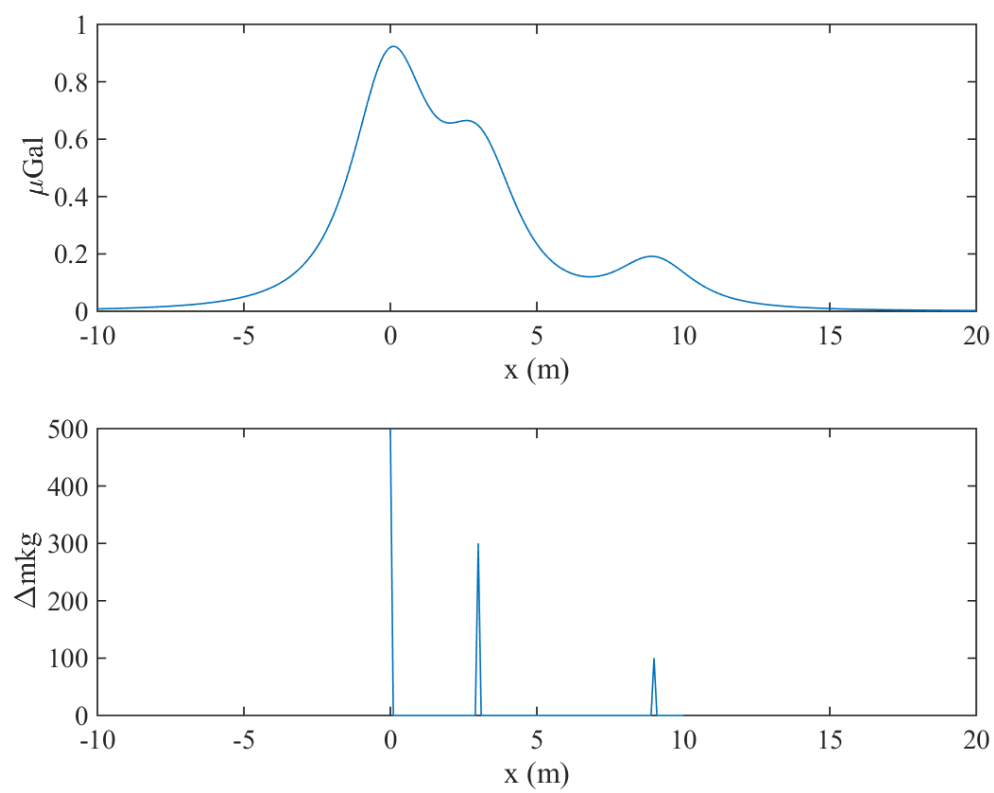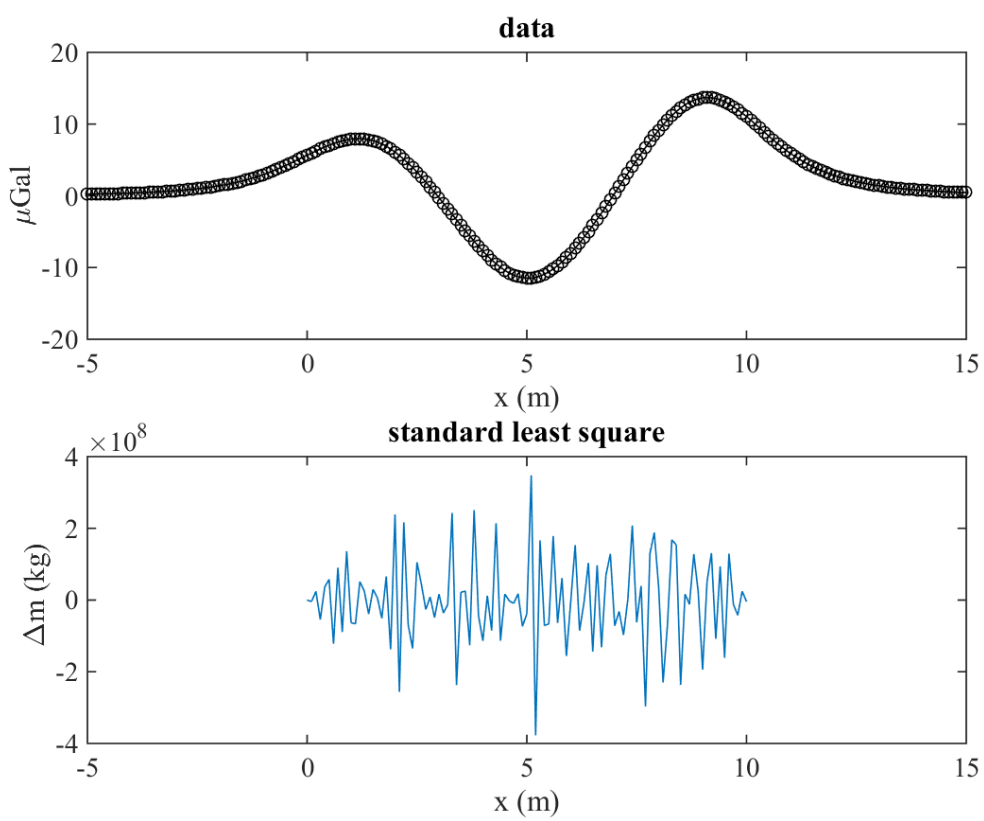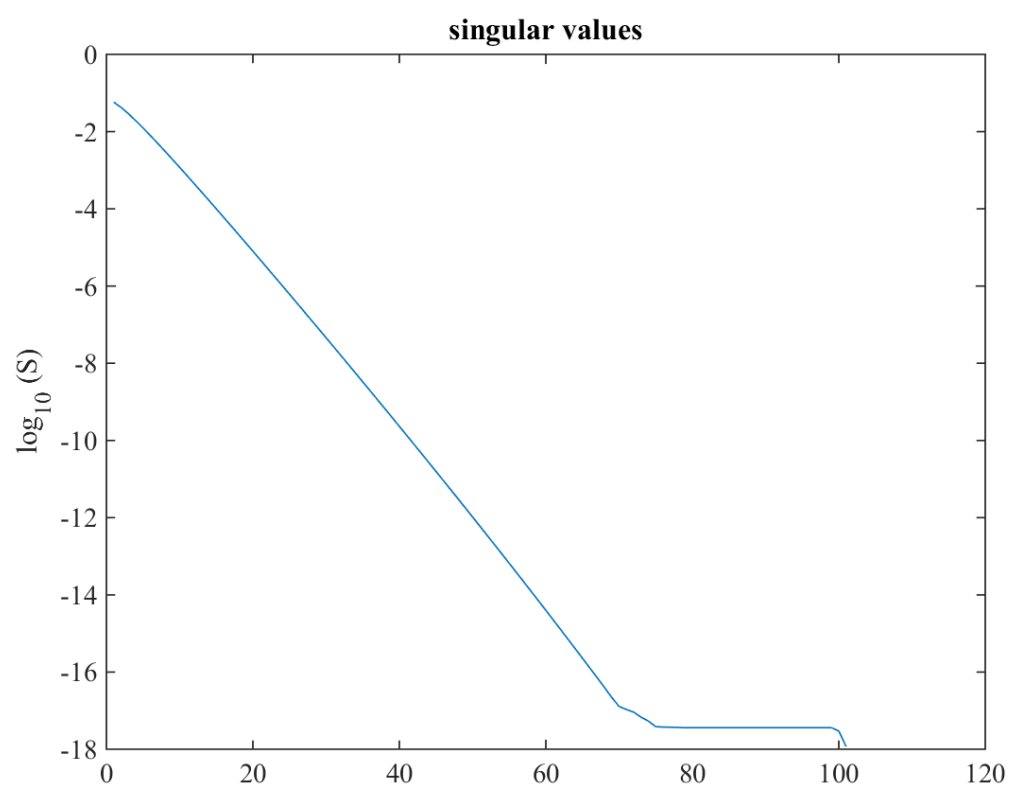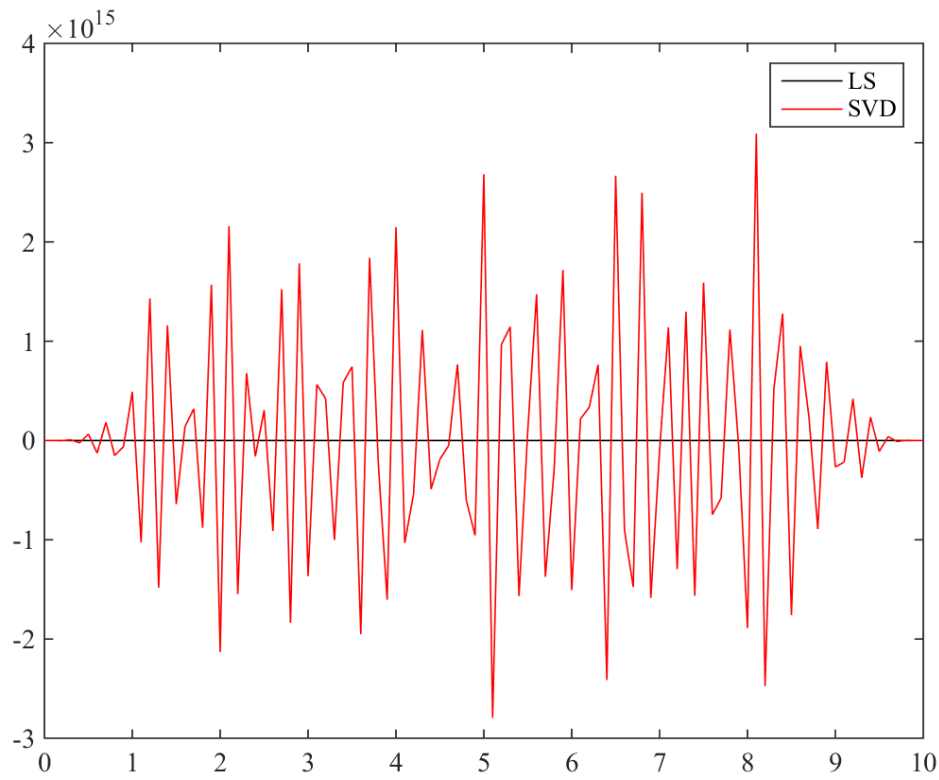
We see that, ..

## (f)

(g)

Figure 1:

Figure 2:

Figure 3:

Figure 4:



Figure 5: