1. The parameters were calculated using the following formula:
   i. Vertical Stress:

   $$S_v(z) = \rho_w g z_w + \int_{z_w}^{z} \rho_b(z) g dz$$

   In the case of Barnett shale the water depth was zero since it was on shore and for Gulf of Mexico the water depth depth was 1000ft.

   ii. Hydrostatic Pressure:

   $$P_p = \rho_w g z$$

   The water density was assumed to be uniform throughout for both cases (1g/cc).

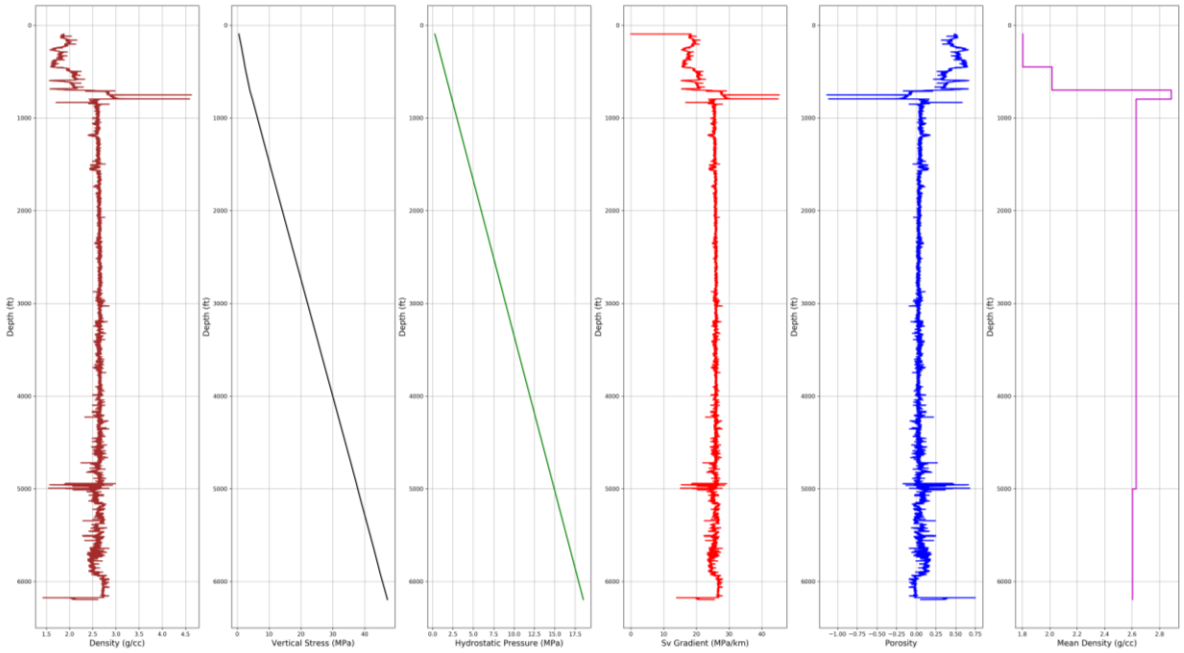
   iii. Gradient of vertical stress:

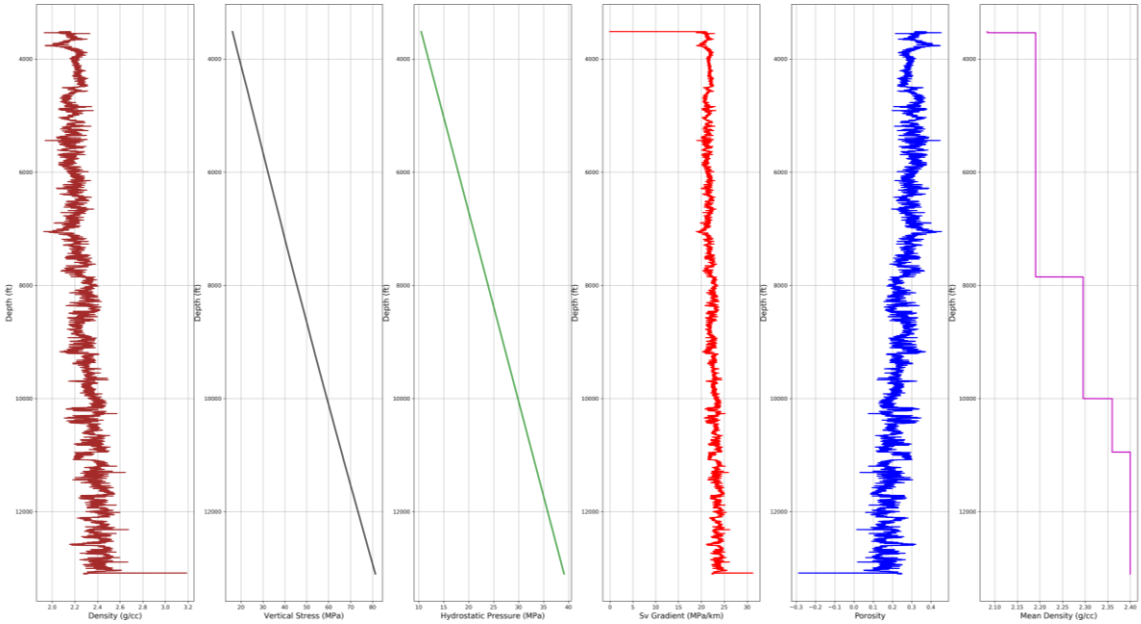
   $$Gradient = \frac{S_v(z_2) - S_v(z_1)}{z_2 - z_1}$$

   iv. Porosity:

   $$\phi = \frac{\rho_{ma} - \rho_b}{\rho_{ma} - \rho_f}$$

2. Plots with higher resolution for both fields are included as image files in the zip folder with their respective names.





3.

i. The division into each blocks is made using visual inspection of the density log and using the respective depths to calculate the average value within the blocks. The plot of the average block density vs the depth is also provided in the same image file as Q.2.

ii. The plot of the average block density vs the depth is also provided in the same image file as Q.2.

iii. By using a continuous density profile, we can estimate the average rock properties and type at a certain depth without requiring to go through all the variation in density logs. For MEM use, the blocked average density profile simplifies the model and the simulation would be more efficient due to less variation in density.

4.

i. Overburden stress in the Barnett shale well at 5000 ft = 37.808 MPa

ii. Pore pressure in the Barnett shale well at 5000 ft = 14.935 MPa

iii. Overburden stress in the GOM well at 5000 ft = 25.839 MPa

iv. Pore pressure in the GOM well at 5000 ft = 14.935 MPa

v. Overburden stress gradient in the Barnett shale well at 5000 ft = 23.580 MPa/km

vi. Overburden stress gradient in the GOM well at 5000 ft = 21.207 MPa/km

vii. Porosity in the Barnett shale well at 2500 ft = 0.029

viii. Porosity in the GOM well at 10000 ft = 0.198

ix. Bulk density in the Barnett shale well at 5000 ft = 2.406 g/cc

x. Bulk density in the GOM well at 5000 ft = 2.164 g/cc

5. For the Volve field, all the calculations were done using the same method as the previous fields. The Data for the Volve field needed to be reformatted to a readable format and that was done using a python code *volve_correction.py* and the corrected data was stored in the text file *volve_corrected.txt*. The corrected data was then used. The assumptions made for the Volve field were:
   a. The volve field well was assumed to have a water depth of 1000 m.
   b. The well was assumed to have an average density of 1.8 g/cc for the rock above the first data point.

   The plots are included in the zip folder.