ES322 In-Class Exercise
Part 1. Estimating Lithostatic Pressure inside the Earth

Let's consider an area of the Earth's surface 1 km x 1 km square, and project it as a rectangular prism of rock to a depth of 5 km inside the crust. Assume a uniform average rock density of 2.9 g/cm3, from top to bottom in the rectangular slice of rock. Draw a block diagram to illustrate the above relationships. Using your conversion tables and rock property equation lists, calculate the following values (SHOW ALL OF YOUR MATH WORK AND UNIT ALGEBRA):

Total of mass of rock in the prism in kg _____

Total mass of rock in the prism in metric tons (t) _____

The total weight of rock in Newtons (N) _____

Total pressure equivalent at base of prism in Pascals (Pa) _____

Total pressure equivalent at base of prisim in MPa _____

Hints / Equations and conversions:

Vol = A x d D = M/V Wt = Mg $g = 9.8\ m/sec^2$ P = F/A

$1\ Pa = 1\ N/m^2$ $1\ N = 1\ kg\text{-}m/sec^2$ $1\ MPa = 1 \times 10^6\ Pa$

Part 2. Understanding Erosion Rates and the Power of Big Geologic Time

Assuming that the mass of rock at the very bottom of the rectangular prism in Part 1 above, is subject to long-term uplift and erosion, with long term average erosion rates on the order of 100 mm/ka. How many years would it take to exhume and expose the basement rocks at the foot of the rectangular prism in Part 1 above? SHOW ALL OF YOUR UNIT ALGEBRA.