HOMEWORK #3

As we will discuss in the coming weeks, turbidity currents flowing through submarine canyons are very similar to water flowing through a river. This means we can extend the simple equation used to calculate the shear velocity we talked about earlier in class, to

$$u_* = \sqrt{R\langle\overline{C}\rangle gHS}$$

where
R = submerged specific gravity of the sediment (1.65 for quartz)
$\langle\overline{C}\rangle$ = depth-averaged volumetric concentration
g = gravity
H = height of the current
S = bed slope

You are interested turbidity currents in Monterey Canyon because the mooring (a way commonly used to deploy current meters, for the landlubbers) you originally deployed there was swept away by one. The dominant material in the canyon is medium-fine quartz sand (D = 400 μm). The along-canyon slope $S = 0.01$. You also discover that the depth-averaged mean concentration in turbidity currents is remarkably constant, such that $\langle\overline{C}\rangle \equiv 0.02$.

You want to redeploy another mooring. Using a Rousean distribution of sediment throughout the current and an assumption that the currents are uniform (i.e., in equilibrium with the bed), determine how high up on the sidewalls above the deepest part of the channel do you have to deploy your mooring in the canyon so that you won't suffer the same fate again (i.e., how high are the turbidity currents – H)?