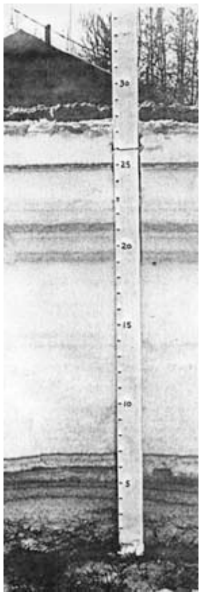

Fig.1. Snowpack cross-section in Fairbanks, AK

a. Determine the snow water equivalent assuming constant snow density $\left(\rho_s = 360kgm^{-3}\right)$ and snow pack depth of 28".

$$h_m = \frac{\rho_s}{\rho_w} h_s = \frac{360kgm^{-3}}{1000kgm^{-3}} 28inches = \underline{\underline{10.08inches}}$$

b. If we're only analyzing a portion of the snow pack, $\left(A = 20m^2\right)$, determine the volume of snow.

$$Vs = V_i + V_w + V_a = Ah_s = \left(20m^2\right)\left(28inches\right) = \underline{\underline{14.224m^3}}$$

c. If the liquid water content (LWC) varies from $0.1 \rightarrow 0.329\frac{m^3}{m^3}$, determine the relationship between the magnitude of liquid water content, with the maginitude of the porosity under constant snow density. Explain the seasonal difference in porosity.

If the snow density is held constant, we can use the following equation to calculate the porosity with a small LWC and a large LWC:

$$\rho_s = (1-\phi)\rho_i + \theta\rho_w$$

When the LWC is small:

$$360kgm^{-3} = (1-\phi)916kgm^{-3} + \left(0.1m^3m^{-3}\right)1000kgm^{-3}$$

then $\underline{\underline{\phi = 0.716}}$

When the LWC is large:

$$360kgm^{-3} = (1-\phi)916kgm^{-3} + \left(0.329m^3m^{-3}\right)1000kgm^{-3}$$

then $\underline{\underline{\phi = 0.966}}$

At a constant snow density, when the LWC is small, the porosity is smaller…and when the LWC is large, the porosity approaches unity.

Porosity is larger in October, when the snowpack is new, and smaller in April when the snow begins to melt.