# Unit 7 Physical Hydrometeorology

All students:
Solve the tasks below that are assigned to your class level. Scan your solutions and submit them to me using your @alaska.edu email prior to the submission deadline. Please give your scanned files a name that has your name included. Note if there is no snow outside where you live, please email me and I will provide you with observational data to solve the problem. Alternatively solve problem 2.

1. **All students:** Follow the instructions in the video and determine snow density and water equivalent.

2. If you can't do task 1 because there is no snow and it's too late to reach me by email, solve this problem. Assume a mature snow pack with a density of 450kg/m$^3$. If the maximum liquid water content it can hold is $\theta = -0.0735\frac{\rho_s}{\rho_w} + 0.267\frac{\rho_s^{\,2}}{\rho_w}$ what will be its porosity?

3. **All students:** On a day, wind speed was 15 m/s and 2 cm water equivalent of snow were measured in a gauge. A couple of meters away from the gauge, a meteorologist measured snow depth the old fashioned way and found 35 cm of new snow, and determined the water equivalent by melting as 2.9 cm. Calculate snow density in both cases and assess the catch deficit of the gauge. What snow water equivalent would the NWS yield for this 35 cm snow event? What consequence would the latter have for the assessment of water availability from snow in a state like California?

4. **ATM625:** Students made the following measurements using a snow tube and thermometer on two different days at five sites. They took snow temperature at the mid-point of the snow depth to represent the average snowpack temperature. On the first day, they found for depth (mm) 920, 940, 1000, 920, 950, and temperature (C) -5, -6, -5.5, -5, -5.5. They determined the water equivalent by melting as 300, 290, 320, 300, and 310 mm, respectively. Ten days later, they measured at the same sites 888, 880, 950, 850, 860 mm, and -1, -1.5, -2, -2.5, -3C, and determined the water equivalent as 360, 350, 340, 330, 350 mm. Determine snow density and cold content for both dates at all sites. Calculate the water equivalent using the conversion ratio typically applied in hydrometeorological measurements. Discuss your results.