

87.202 - PRINCIPLES OF EARTH & ENVIRONMENTAL SYSTEMS II
STUDY QUESTIONS AND PROBLEMS IV

1. Define isobar. What is an isobaric map?

2. On a surface weather chart the 4 mb isobars are 200 km apart. For air, $\rho = 1.293 \times 10^{-3} \text{ g cm}^{-3}$.
 - a. Calculate the acceleration due to the pressure-gradient force. (ans: 0.155 cm s^{-2})

 - b. If this force acts for 2 hours, calculate the resultant velocity of the air. (ans: $1,116 \text{ cm s}^{-1}$)

 - c. If this force acts for 24 hours, calculate the resultant velocity of the air. Calculate the velocity both in km hr^{-1} and miles hr^{-1} . (ans: 482 km h^{-1} ; 300 mi h^{-1})

 - d. Why don't we observe wind velocities as high as those calculated in part c?

3. Explain the cause of mountain and valley winds.

4. Suppose that at the coast the temperature of the air over the land, 2 or 3 hours after sunrise, is 20°C while the temperature of the air over the sea is 15°C . Assume that the temperature is constant with height and that the pressure at sea level is 1000 mb over both the land and the sea.

a. Calculate the pressure difference between the land and the sea at a height of 100 m. (ans: 0.2 mb)

b. If the distance between the points having that pressure difference is 5 km, calculate the pressure force per unit mass (or the acceleration). (ans: 0.309 cm s^{-2})

c. Calculate the velocity of the wind if this force acts for one hour. (ans: $1,114 \text{ cm s}^{-1}$)