

## Study Questions - Lecture 2

Let us write the general conservation equation for humidity in the air:

$$0 = \frac{\partial \rho_v}{\partial t} + u \frac{\partial \rho_v}{\partial x} + v \frac{\partial \rho_v}{\partial y} + w \frac{\partial \rho_v}{\partial z} \quad (1)$$

where  $\rho_v$  is vapour density (same as absolute humidity). For the purpose of this set of questions, we assume there is no condensation or vaporization happening.

1. What does the term  $\frac{\partial \rho_v}{\partial t}$  describe, and what is the unit of the term?
2. What does the term  $u \frac{\partial \rho_v}{\partial x}$  describe, and what is the unit of the term?
3. Assume horizontally homogeneous conditions, and  $\frac{\partial \rho_v}{\partial z} = -1 \text{ g m}^{-3} \text{ m}^{-1}$ .  
 $u = 2 \text{ m s}^{-1}$ ,  $v = 0 \text{ m s}^{-1}$  and  $w = 0.1 \text{ m s}^{-1}$ . Is the air drying out, becoming more humid, or is the humidity staying constant?