Cloud Physics Lab
LAB 1: Thermodynamics Properties of Air

Purpose:

Compute the thermodynamics properties of air for given temperature observations for given date.

Theory:

The thermodynamics properties of air are:

Virtual temperature

$$T_v = T\,(1 + 0.608r) \tag{1}$$

Potential temperature

$$\theta = T\,(1000/P)^{R_d/C_p} \tag{2}$$

Saturated water vapor pressure

$$E = E_o \exp(\frac{L}{R_v} * \frac{T - T_o}{TT_o}) \tag{3}$$

where:

Rd=287 JK^{-1}kg^{-1},   Cp=1004 JK^{-1}kg^{-1},   L=2500000 Jkg^{-1},
E$_o$=6.11 hpa,   T$_o$=273.16 K.

Water vapor pressure (e),

$$r = 622\frac{e}{P} \tag{4}$$

Relative humidity

$$h = e\,/\,E \tag{5}$$

Methodology:

1- Calculate the thermodynamics properties for the following data:
   Time= 6 9 12 15 18 21 24 (LST)
   Temp= 19.5 21.7 23.9 26.7 24.5 17.2 18.4 (C)
   Pres=1012.4 1013.5 1014.7 1015.0 1014.3 1013.2 1012.1 (hPa)
   MixR= 15 16 18 20 19 17 14 (g/kg)
2- Plot and discuss results