

相对位温算法

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题目 0 注记.

相当位温:

$$\theta_e = \theta \exp\left(\frac{Lr}{C_p T_d}\right) = T \left(\frac{p}{p_0}\right)^{-\frac{R}{C_p}} \exp\left(\frac{Lr}{C_p T_d}\right)$$

简化:

$$\theta_e = T \left(\frac{p}{p_0}\right)^{-\frac{R}{C_p}} \exp\left(\frac{Lr}{C_p T_d}\right)$$

$$R = R_d = 287.05 \quad C_p = C_{pd} = 1004 \quad T_d = \quad \text{Lr T: 温度 (K) TD: 露点}$$

温度 (K) P: 气压 (hPa) e: 水蒸气压 (hPa) x: 混合比 (kg/kg)

$$\theta_e = T \left(\frac{1000}{P-e} \right)^{\frac{R_d}{C_{pd}}} \left(\frac{T}{T_{LCL}} \right)^{0.28x} \exp \left(\left(\frac{3036.0}{T_{LCL}} - 1.78 \right) x (1 + 0.448x) \right)$$

TCL 计算

$$T_{LCL} = \frac{1}{\frac{1}{T_D - 56} + \frac{\ln(T/T_D)}{800}} + 56$$

饱和水汽压

$$e_s = 6.112 \exp \left(\frac{17.67(T-273.15)}{T-29.65} \right)$$

水汽压

$$e = \frac{e_s \exp \left[\frac{a(T_d - 273.15)}{T_d - b} \right]}{\exp \left[\frac{a(T - 273.15)}{T - b} \right]}$$

混合比

$$x = 0.622 \frac{e}{P-e}$$