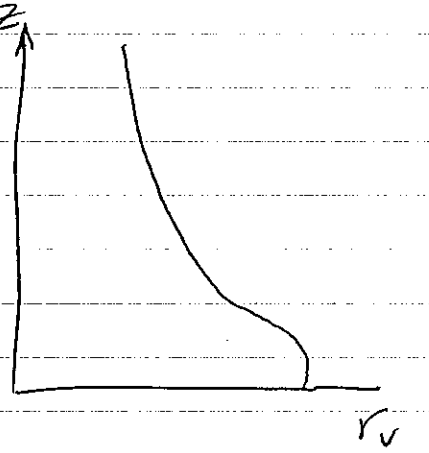
Integrated water vapor



Problem 7.19 (Tsonis) p. 127

$$\rho_w d_w = \int_0^\infty \rho_v \, dz$$

$\frac{m}{L^3} L$ $\frac{m}{L^3} \cdot L$ $\frac{m}{L^2}$ unit area

Tsonis, p. 154

$$d_w = \frac{1}{\rho_w} \int \rho_v \, dz$$

$$= \frac{1}{\rho_w} \int r_v \rho_a \, dz \qquad \rho_a = \text{air density}$$

$$\frac{dp}{dz} = -\rho g, \quad dp = -\rho g \, dz, \quad dz = -\frac{dp}{\rho g}$$

$$\therefore d_w = -\frac{1}{\rho_w g} \int_{p_0}^{0} r_v \frac{\rho_a}{\rho_a} \, dp$$

$$= \frac{1}{g \rho_w} \int_0^{p_0} r_v \, dp$$

Discrete $\Rightarrow$ $IWV = \frac{1}{g \rho_w} \sum_{i=1}^{n} \bar{r}_{v_i} \Delta p_i$ (sign)