

Geography 416-411
Exercise #4
Temperature Profile
10 points

Name: _____

1. Given the following temperature profile:

z(cm)	5	10	20	30	50	100	150
T(°C)	16.3	15.4	14.6	14.4	14.0	13.6	13.2
K_h							

Determine: Temperature scale factor, z_h (m)

Temperature Profile Formula (1st approximation only)

Sensible Heat Flux, H (W/m²)

Thermal Diffusivity, K_h (m² / s, for each z above)

Note: $\rho_{\text{air}} = 1.205 \text{ kg / m}^3$

$C_p = 1005 \text{ J / kg}^\circ\text{K}$

k (von Karman) = 0.39

$u_* = .194 \text{ m / s}$

$z_0 = .012 \text{ m}$

Key Equations: $\text{Slope}_{10} = [(y_2 - y_1) / (L)] / (x_2 - x_1)$

$z_h = .2 z_0$

$\text{Slope}_e = 2.303 \text{ Slope}_{10}$

$T_* = 1 / \text{Slope}_e$

$T = T_0 + T_* \ln (z / z_h)$

$H = \rho_{\text{air}} C_p k u_* T_*$

$K_h = k u_* z$

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