

# LOCAL LAKE ANALYSIS

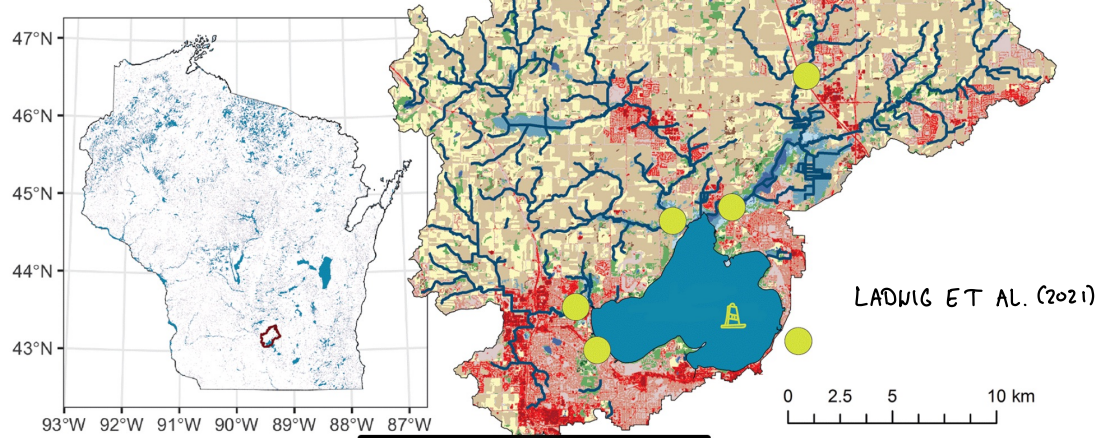
- MODEL = GOTM
- GCM = GFDL-ESM
- SCENARIO = SSP5-8.5  
2015-2100

- LAKE MENDOTA,  
WISCONSIN, USA
- EUTROPHIC
- DIMICTIC
- ~ 25 m DEEP

## Land Cover



- USGS Gage (Yellow circle)
- Lake Mendota buoy (Yellow 'A' in a circle)



# SCHMIDT NUMBER

MASS OF WATER

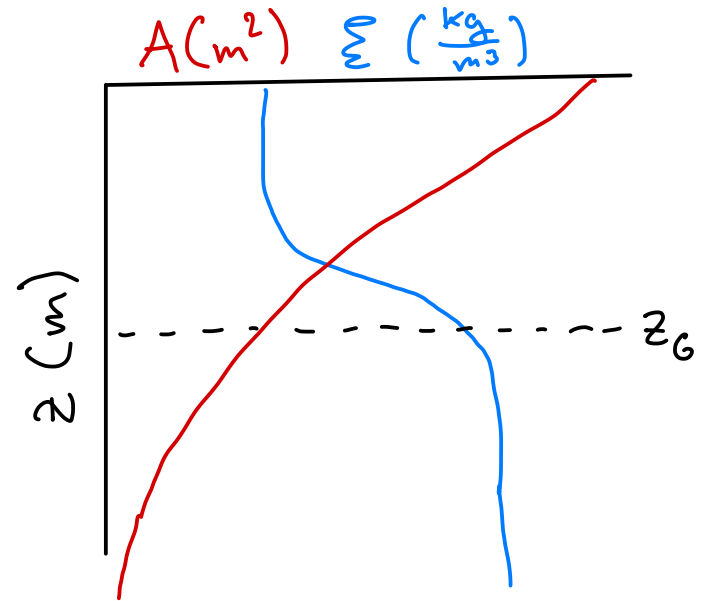
$$M = \int \rho A dz$$

CENTER OF MASS / GRAVITY

$$\begin{aligned} z_G &= \frac{1}{\int \rho A dz} \int z \rho A dz \\ &= \frac{1}{M} \int z \rho A dz \end{aligned}$$

MEAN DENSITY

$$\hat{\rho} = \frac{1}{V} \int \rho A dz$$



$$S_t = \frac{g}{A_0} \int (z - z_G)(\rho - \hat{\rho}) A dz$$

# LAKE NUMBER

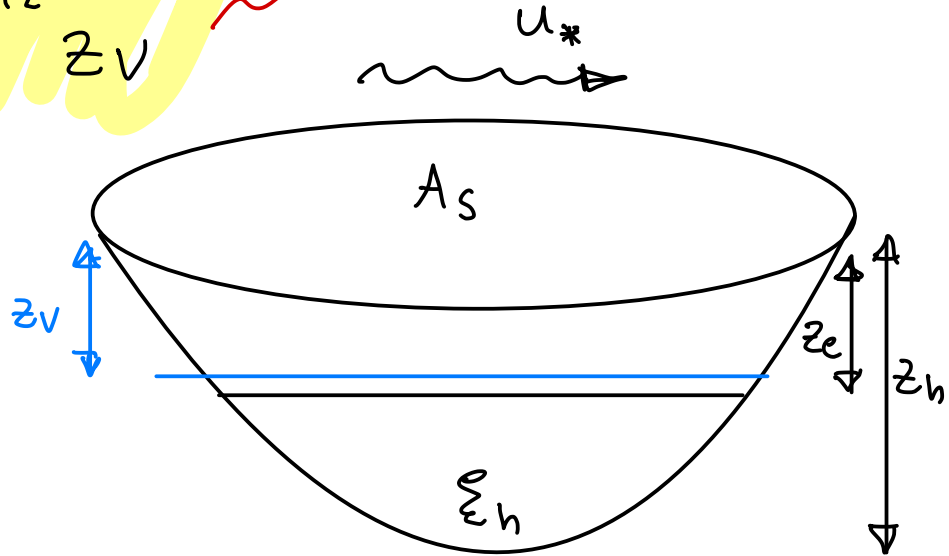
$$L_N = \frac{S_t (z_e + z_h)}{2 \Sigma_h u_*^2 A_s^{1/2} z_v}$$

STABILIZING FORCES

MIXING FORCES

CENTER OF VOLUME

$$z_v = \frac{1}{V} \int z A dz$$



# COUPLED MODEL

① TEMPERATURE OUTPUT FOR MIXING  
(HONDZO & STEFAN, 1993)

$$K_z = \alpha_k (N_z^2)^{-0.43} \quad \text{WITH } \alpha_k = 0.00706 A_s^{0.56}$$

$$N_z^2 = \frac{\rho}{\xi_z} \frac{d\xi_z}{dz}$$

② BUILD OUR MODEL

$$\frac{dC}{dt} = K \frac{d^2 C}{dz^2} \xrightarrow[\text{(FTCS)}]{\text{NUMERICS}} C_n^{t+1} = C_n^t + K \frac{\Delta t}{\Delta z^2} (C_{n+1}^t - 2C_n^t + C_{n-1}^t)$$

③ BE CREATIVE

