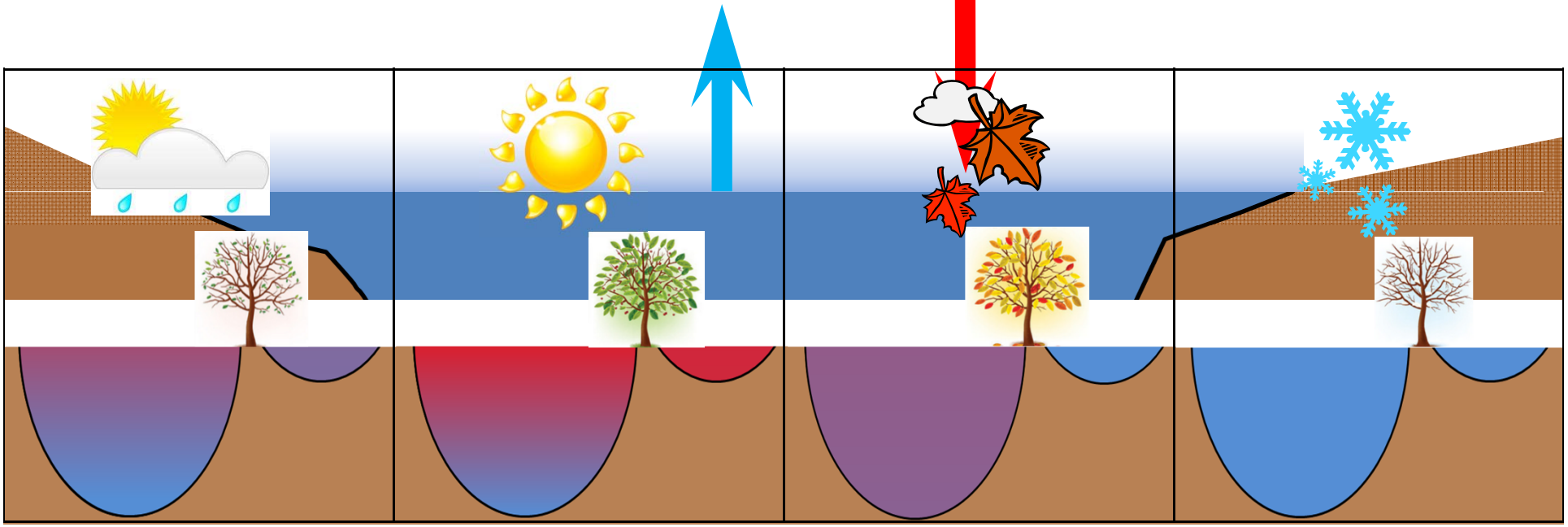



Seasonal Evaporation of Two Different Morphometry Lakes Under Changing Climate

WICCI



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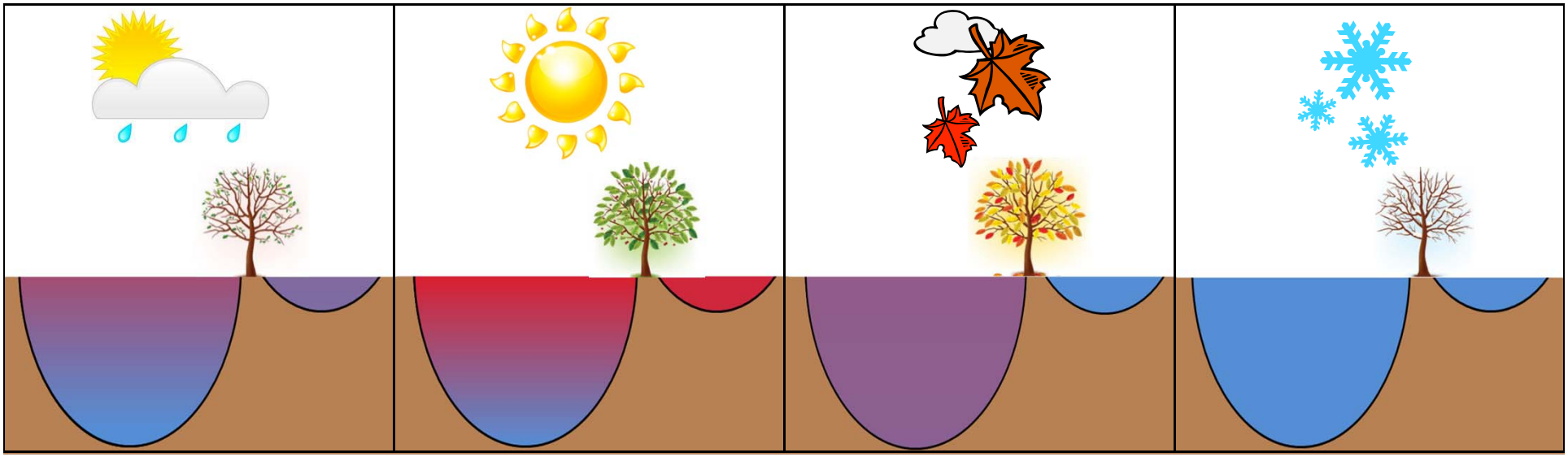
37th Annual Meeting American Water Resources Associations Wisconsin Section

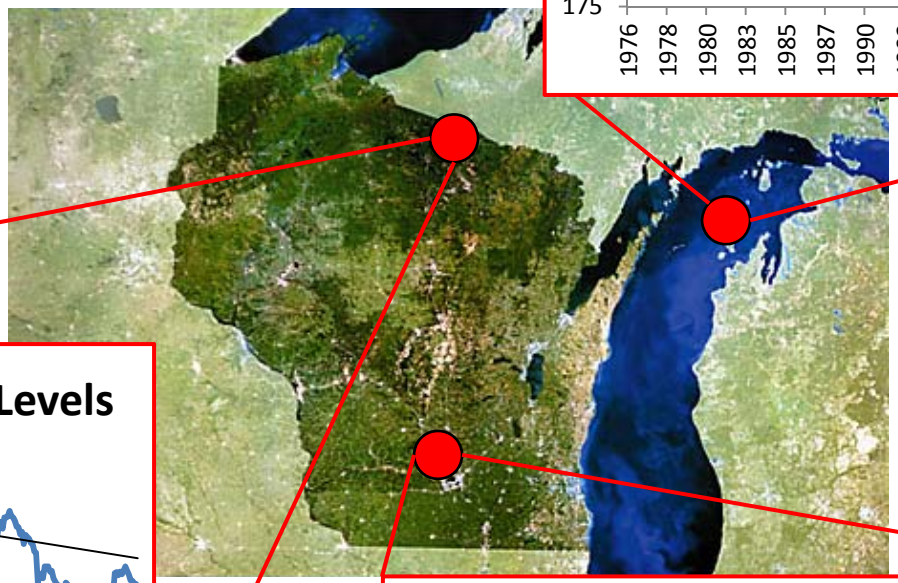
Nathan Gerdts and Chin Wu

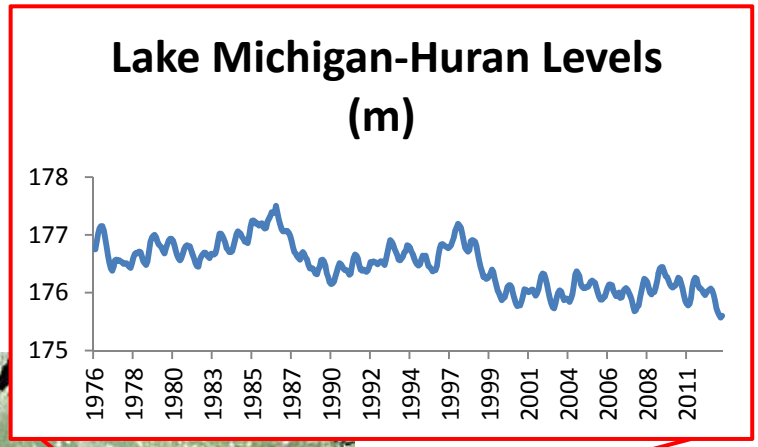
University of Wisconsin, Madison

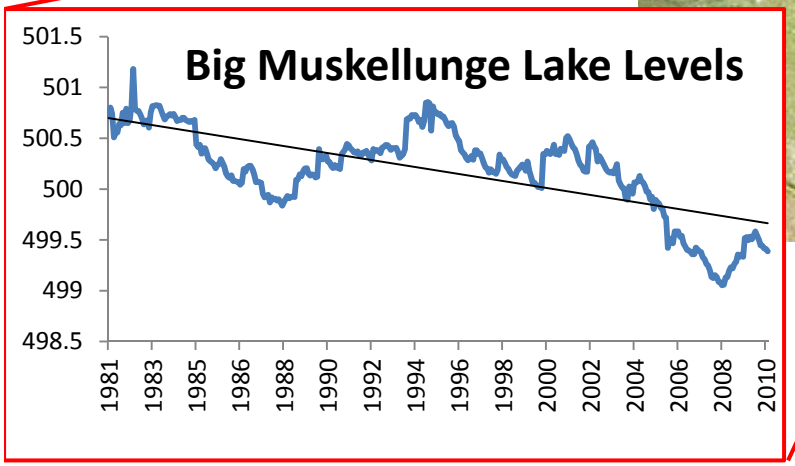


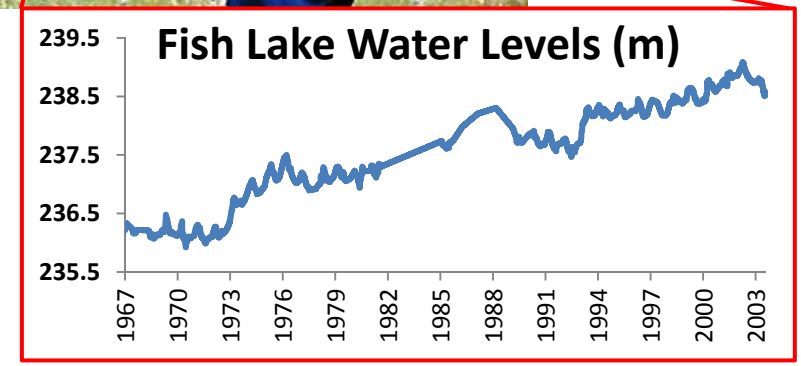
Great Lake Evaporation

Wisconsin Lake Evaporation?



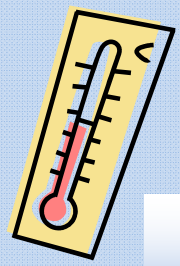


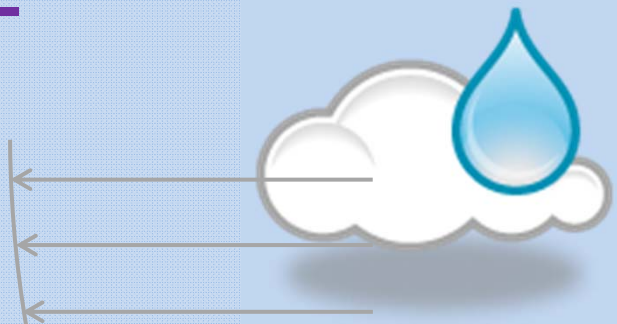


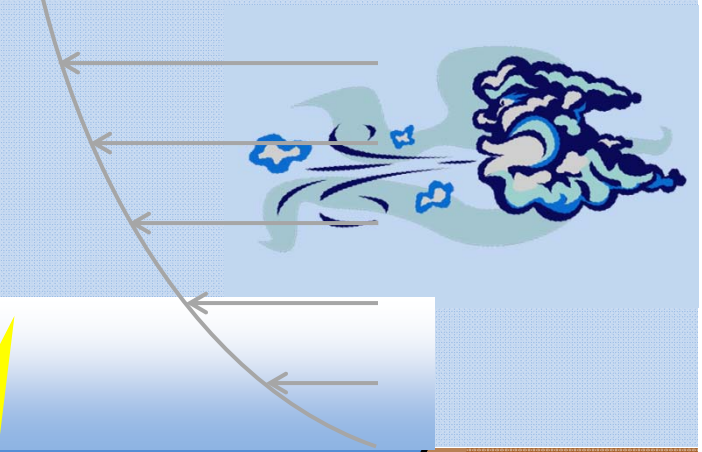


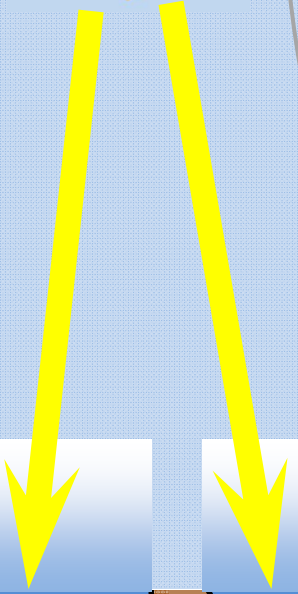
Climate Drivers of Evaporation

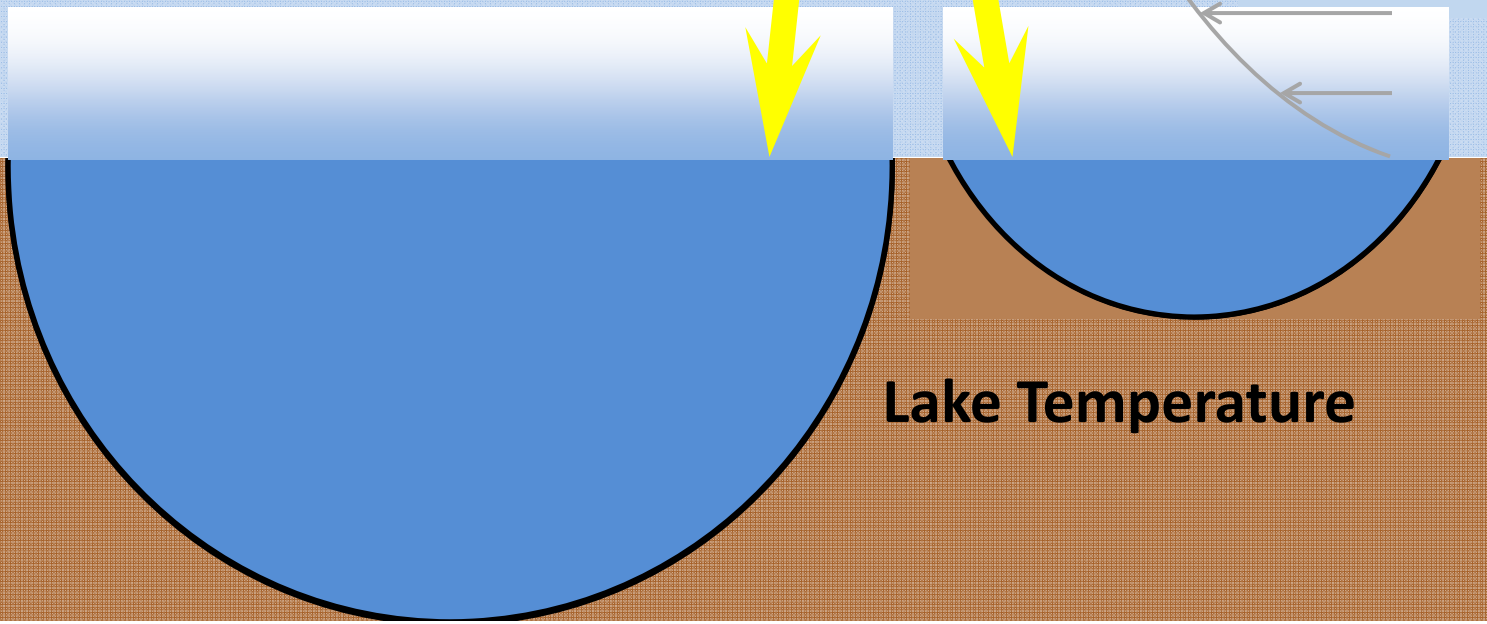
- Air Temperature
- Solar Radiation
- Wind Speed
- Vapor Pressure







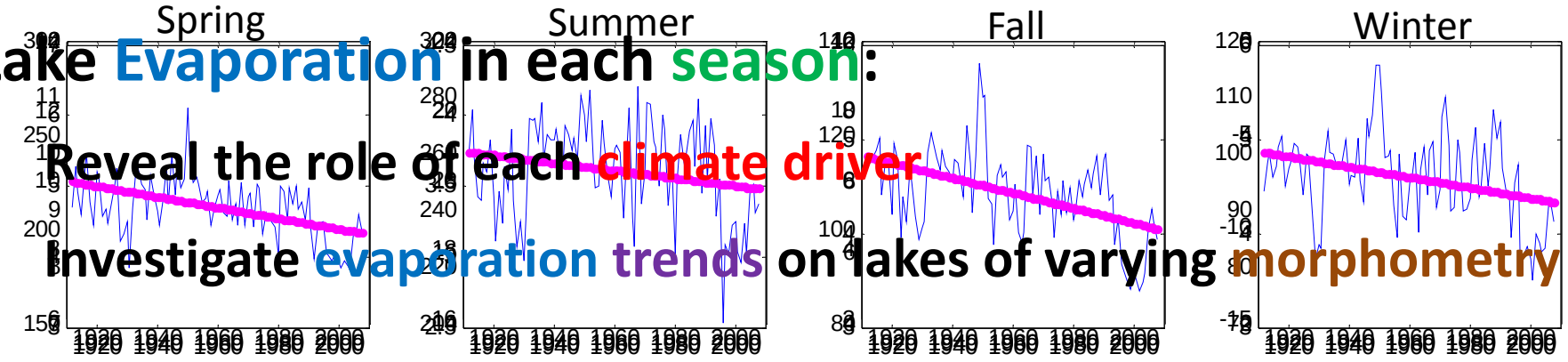


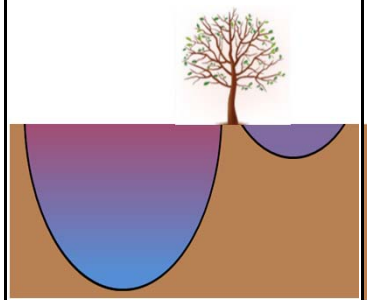
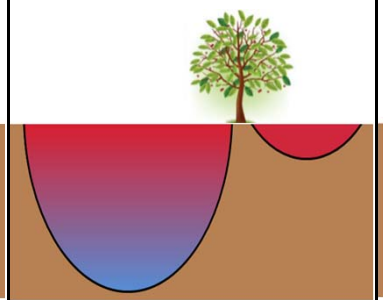
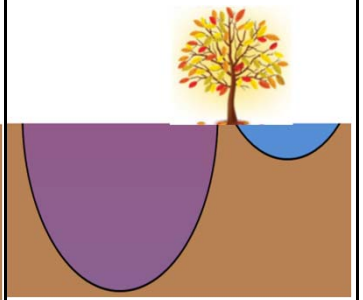
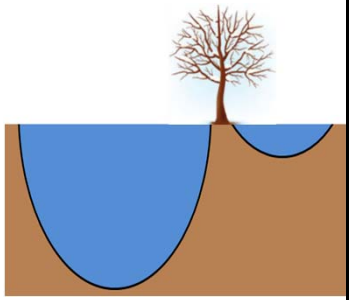


Research Objective:

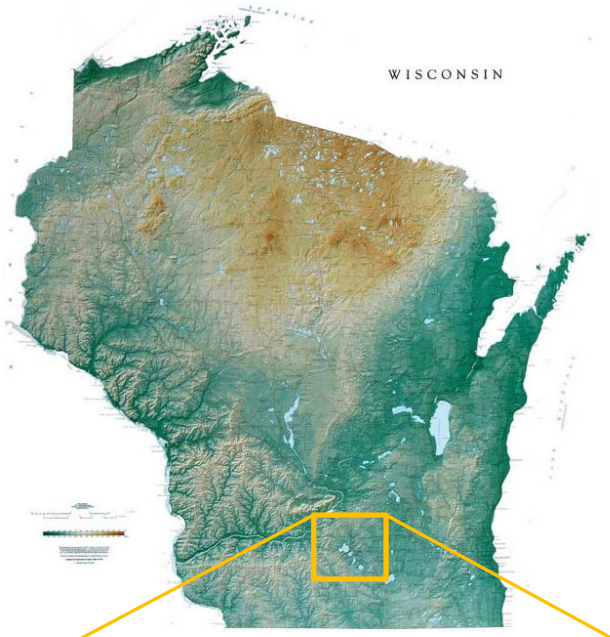
Lake Evaporation in each season:

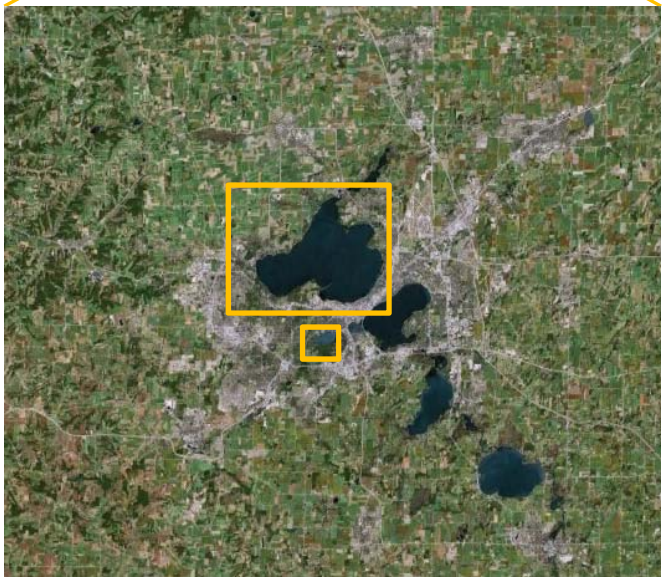
- Reveal the role of each climate driver
- Investigate evaporation trends on lakes of varying morphometry

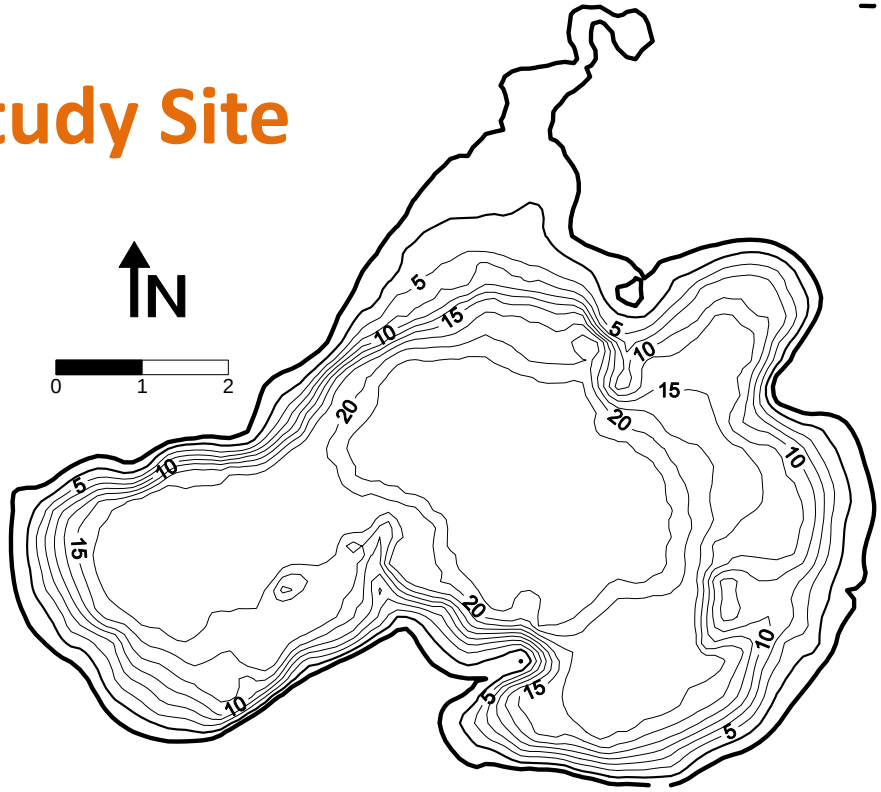


	Spring	Summer	Fall	Winter
	↑	↑	↑	↑
	↓	—	—	↓
	↓	↓	↓	↓
	—	↑	—	—
				

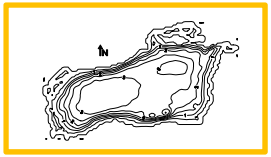
Study Site



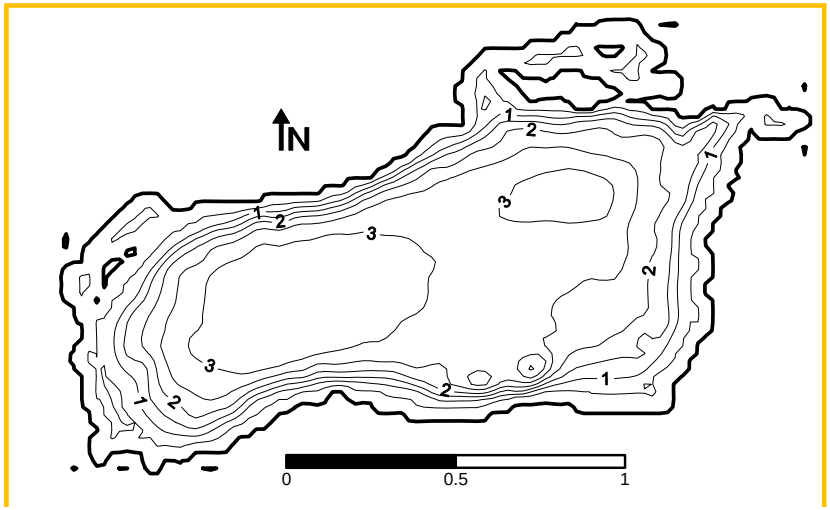




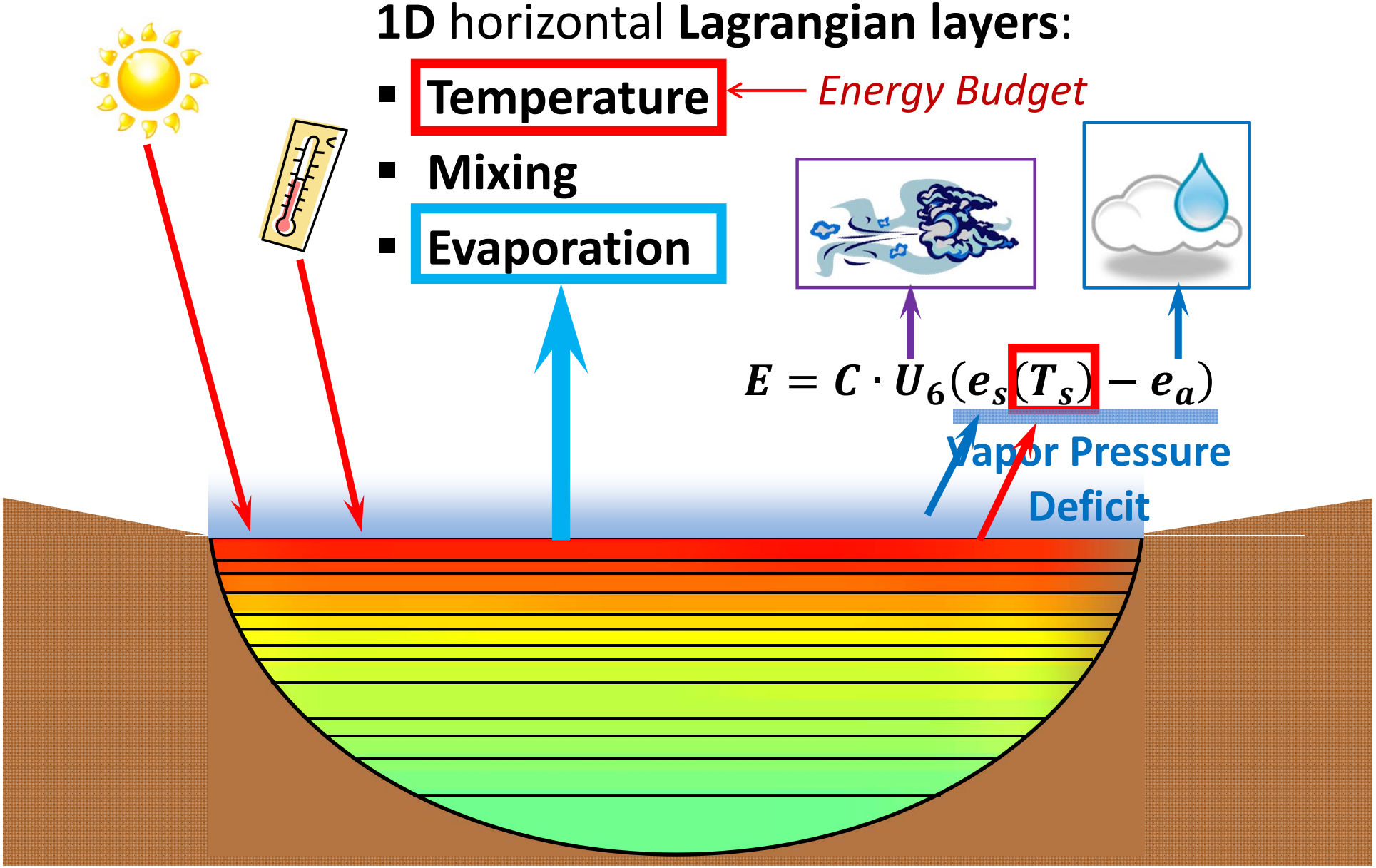
Lake Mendota



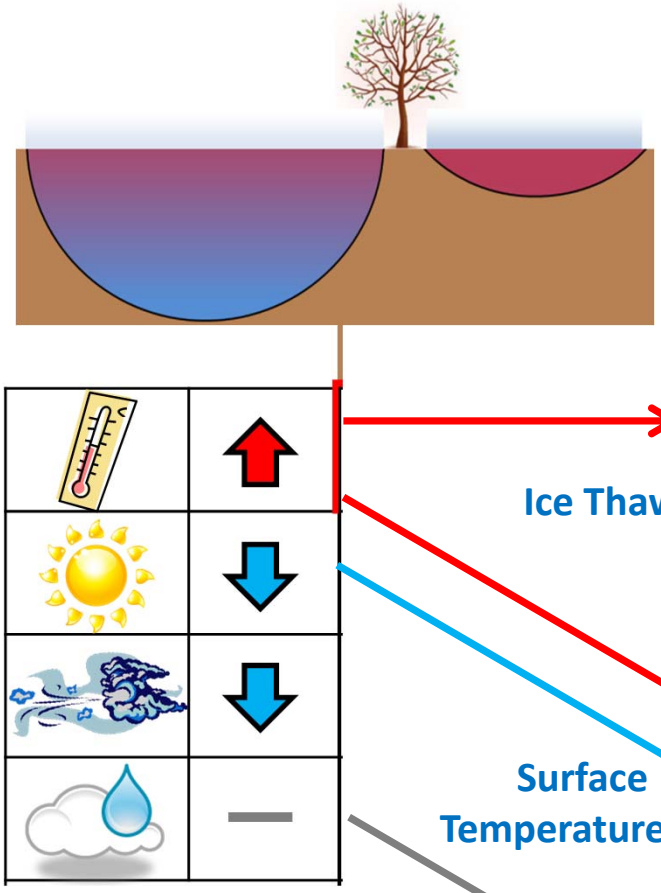
Lake Wingra



DYRESM (DYnamic REservoir Simulation Model)



Spring Evaporation

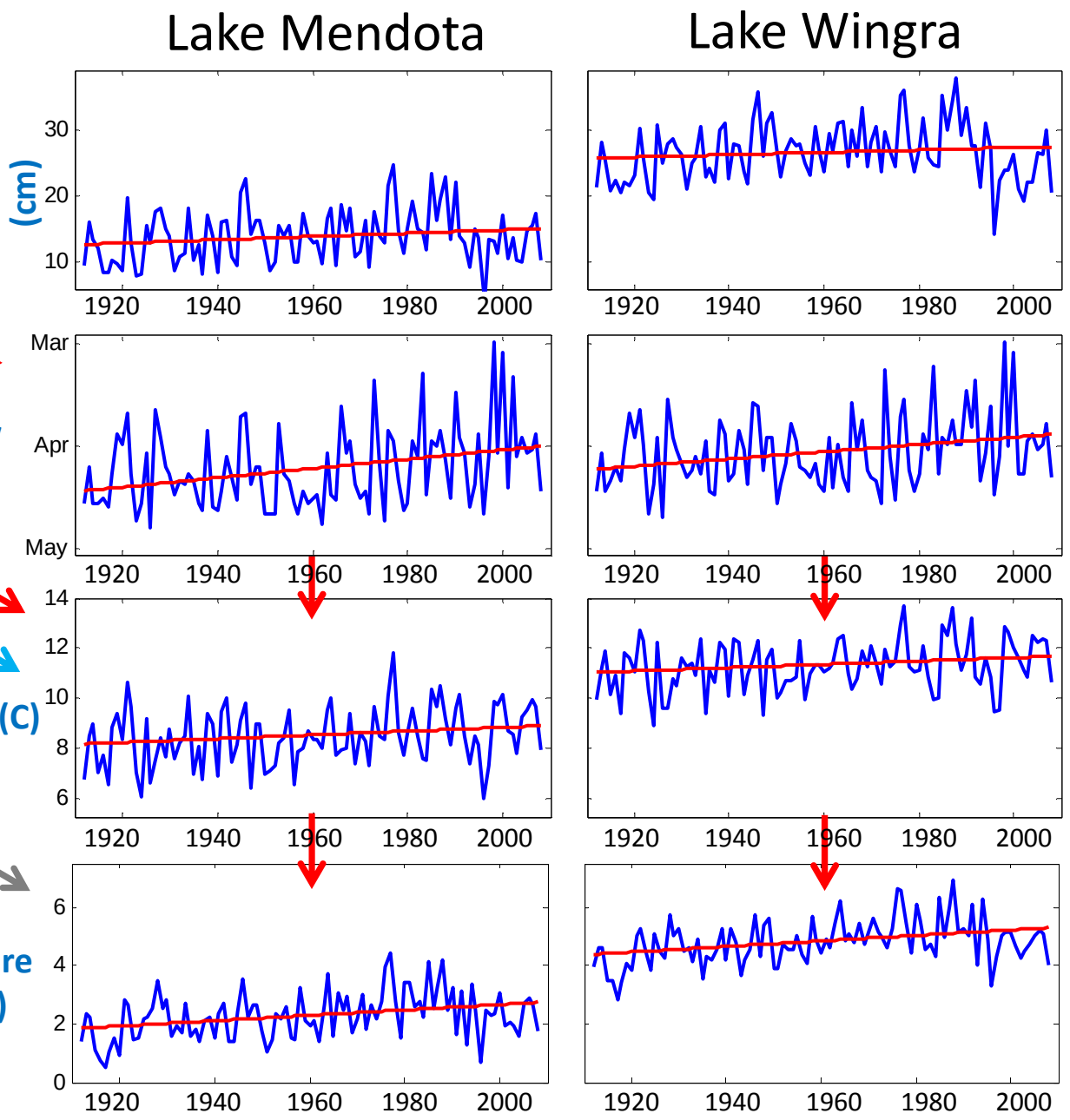


Ice Thaw

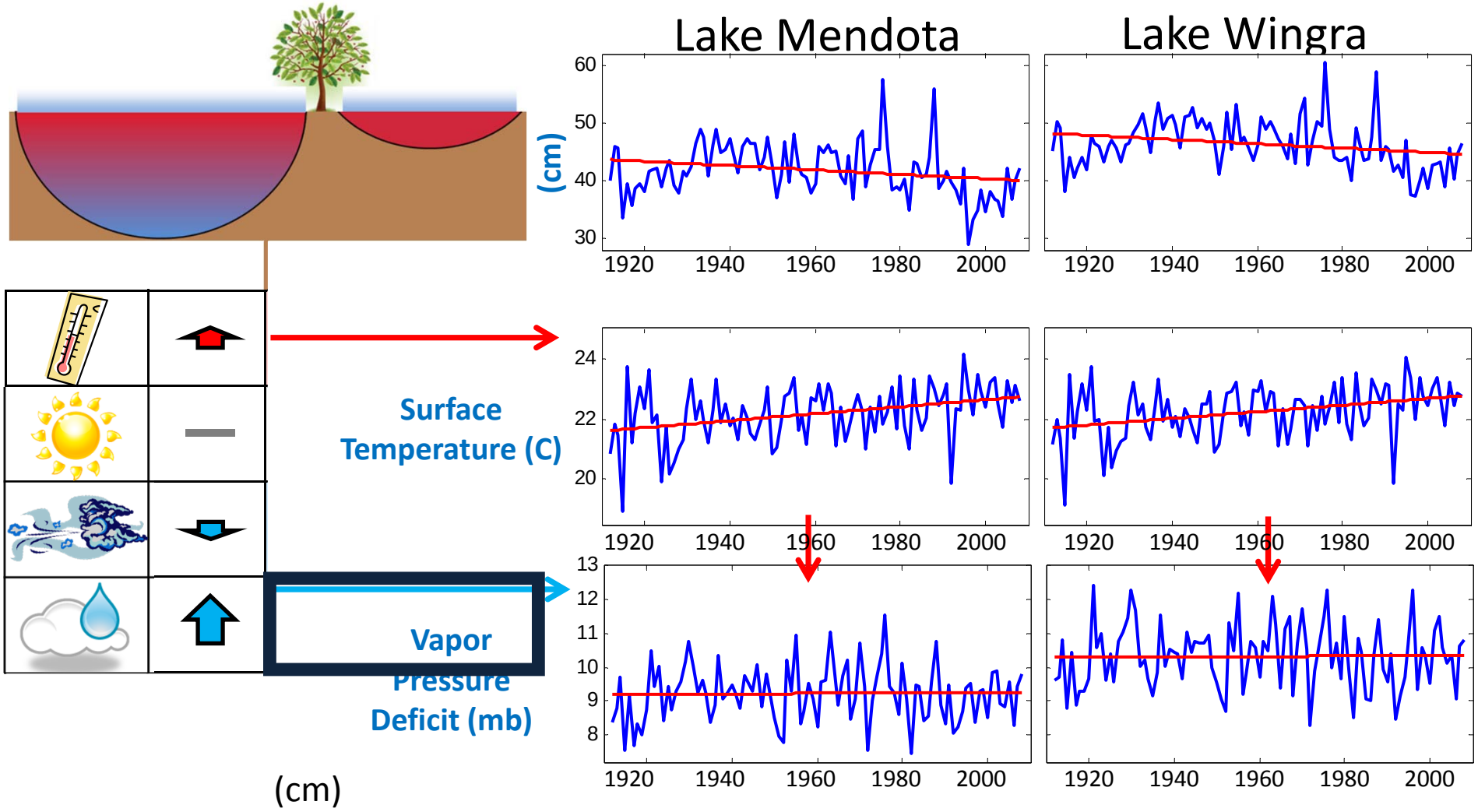
Surface Temperature (C)

(cm)

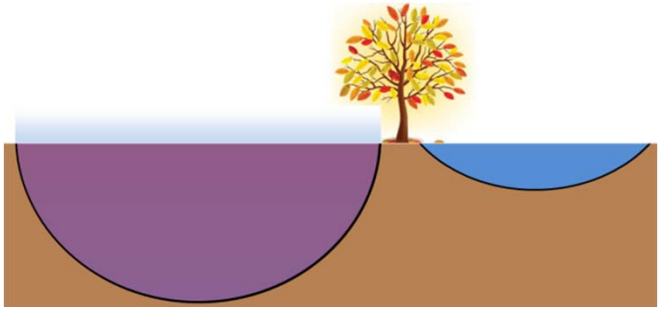
Vapor Pressure Deficit (mb)

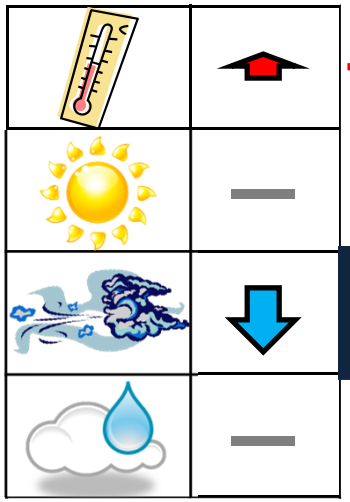


Summer Evaporation



Fall Evaporation



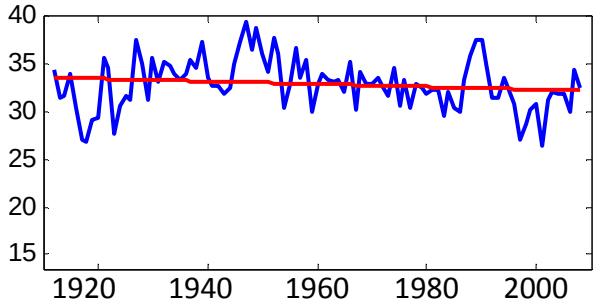


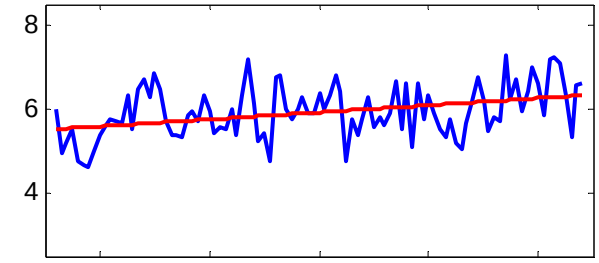
Vapor Pressure Deficit (mb)

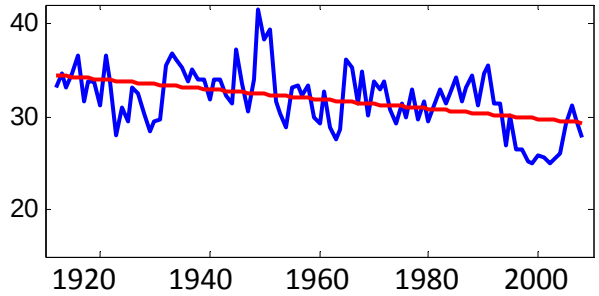
Wind-Induced Evaporation (cm)

(cm)

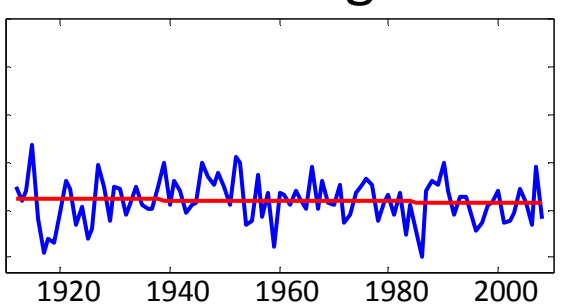
Lake Mendota

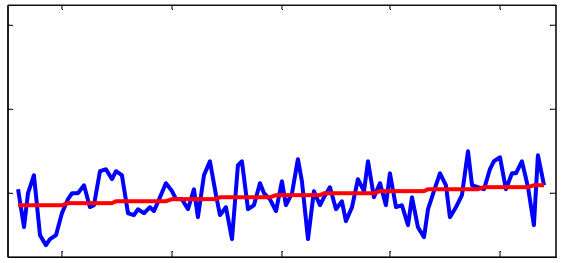


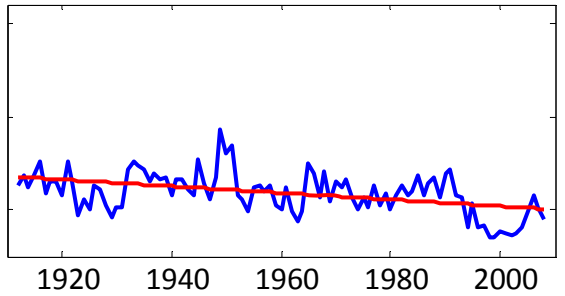




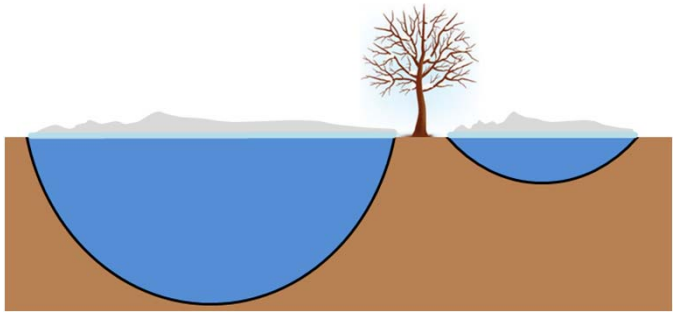
Lake Wingra

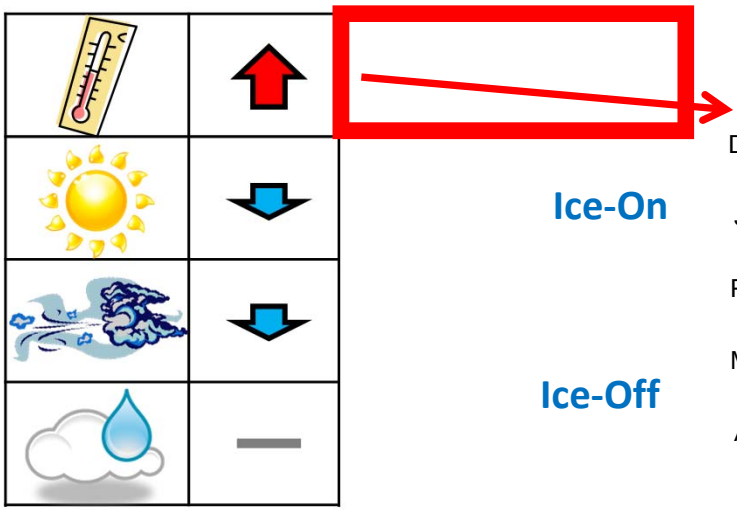






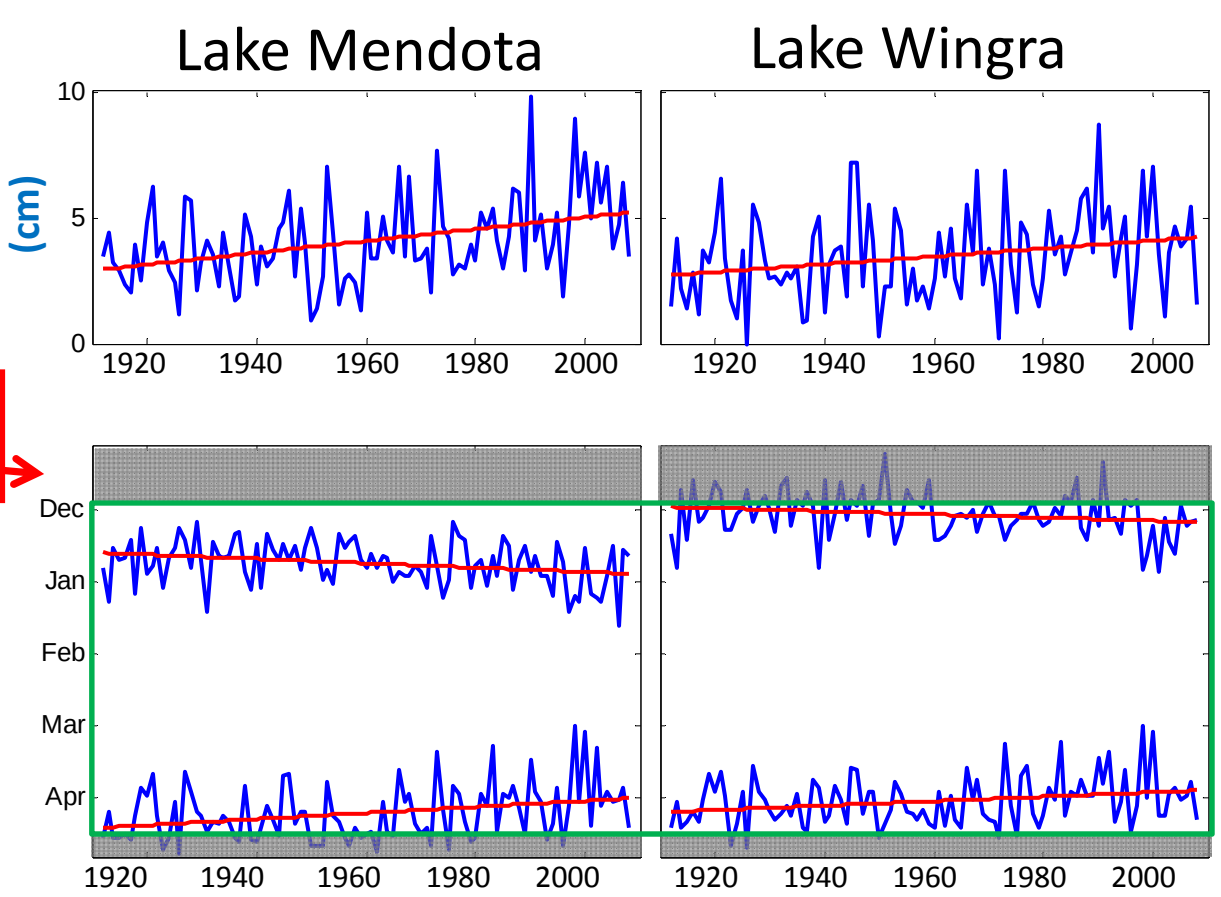
Winter Evaporation





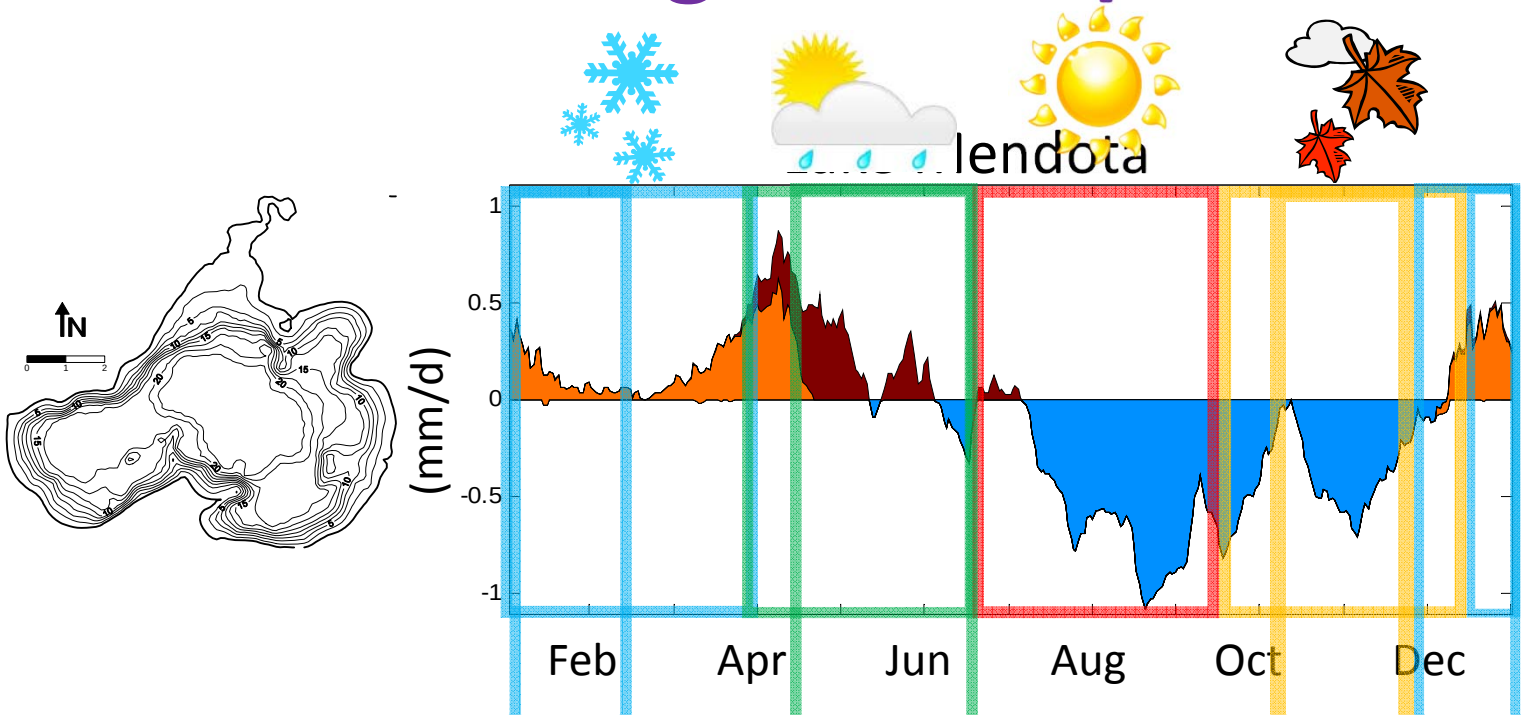
Ice-On

Ice-Off



(cm)

Changes in Evaporation



Increases

Increase from lost Ice

Decreases

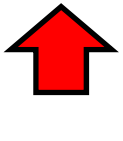
Summary & Conclusions

Evaporation **Climate Driver**

- **Spring**
- **Summer**
- **Fall**
- **Winter**



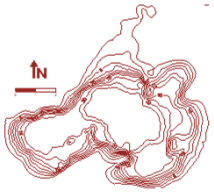





	↑	2.7	3.0
	↓	-0.2	-0.5
	↓	0.1	-0.4
	—	0.2	0.3
Total Change:		2.8	2.5

Morphometry **Sensitive**

- **Deep Lakes:**  **Fall**
- **Shallow Lakes:**  **Spring**


Acknowledgements

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Wife:

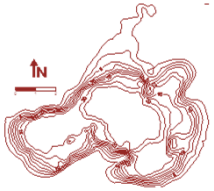
Michi Gerdts

Questions?

Evaporation **Climate Driver**

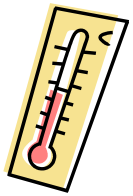
- **Spring**   
- **Summer**   
- **Fall**   
- **Winter**   

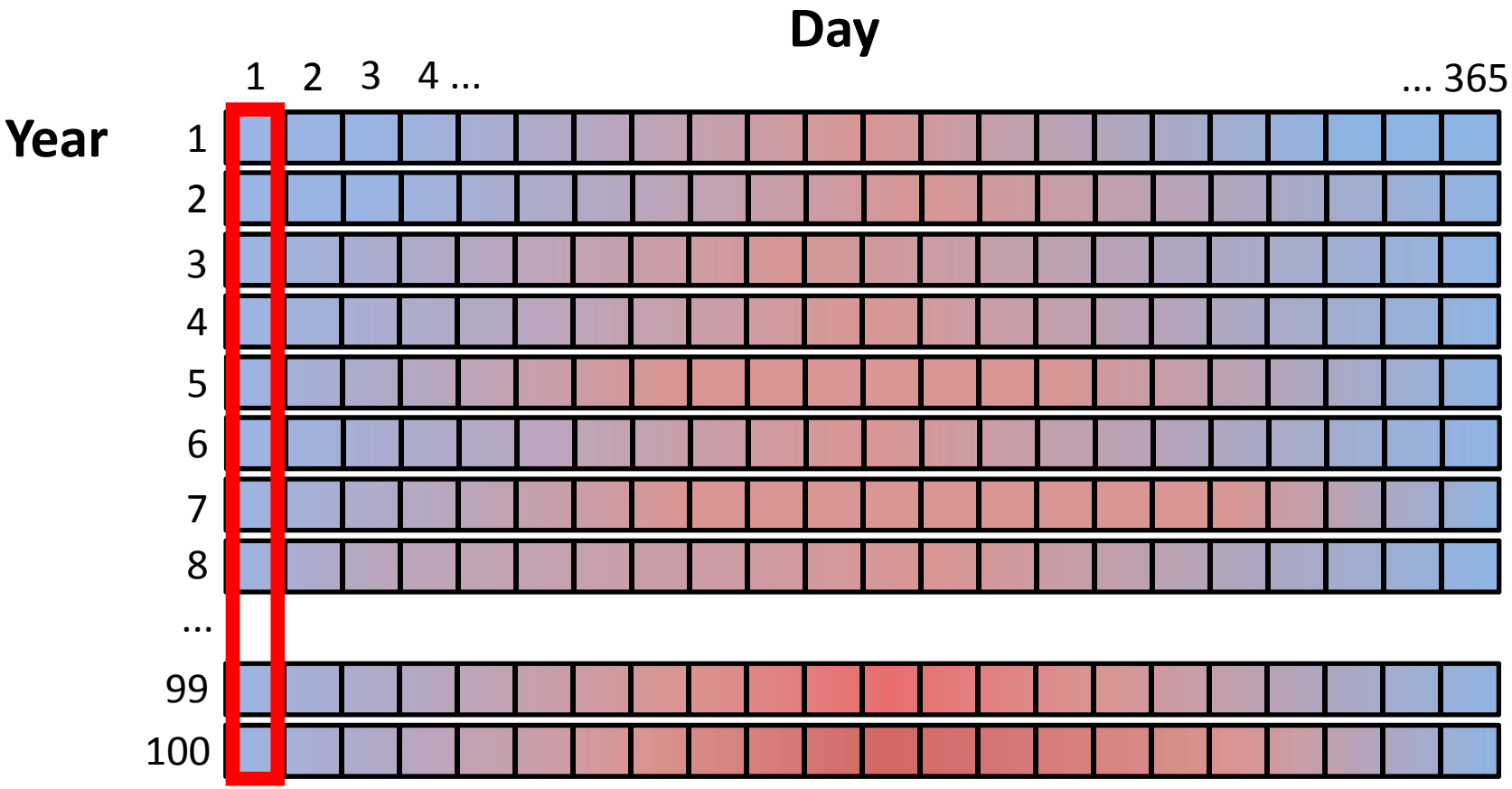
Morphometry **Sensitive**

- **Deep Lakes:**  **Fall** 
- **Shallow Lakes:**  **Spring** 

Future Climate Scenario

Adjust Climate Drivers based on trends throughout year





Trend for each day of year

Future Climate Scenario

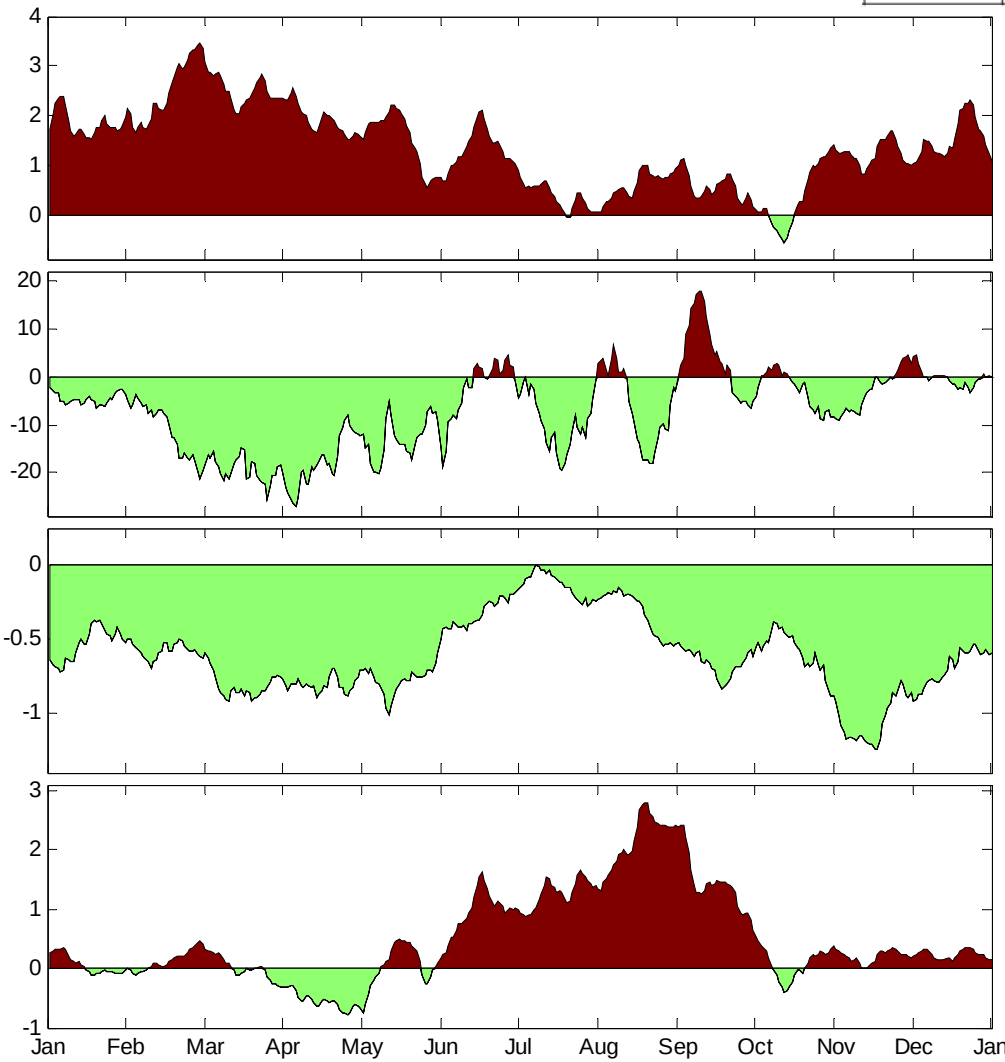
Winter	Spring	Summer	Fall
↑	↑	↑	↑
↓	↓	—	—
↓	↓	↓	↓
—	—	↑	—

Air Temperature (°C)

Solar Radiation (W/m^2)

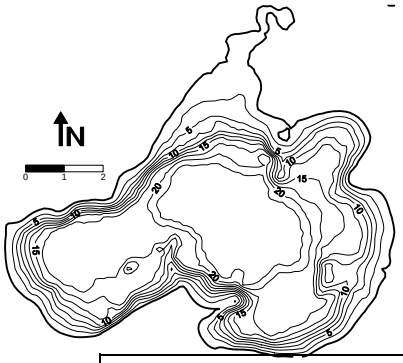
Wind Speed (m/s)

Vapor Pressure (mb)



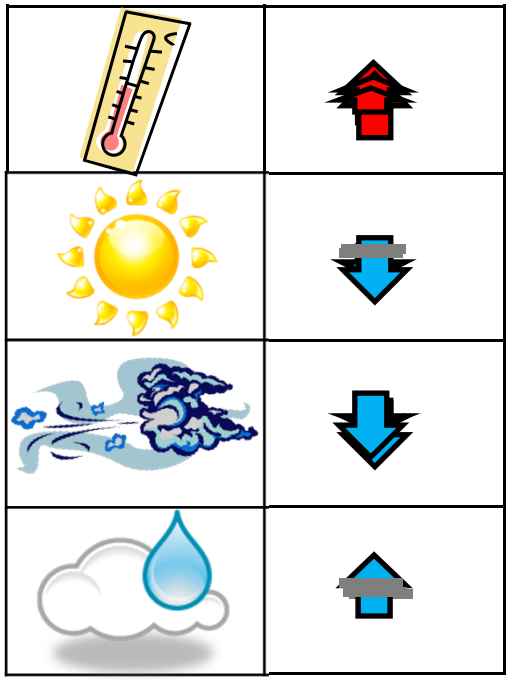
Trends applied to model input data

Results: Relative Magnitudes from each Driver



Lake Mendota

	Solar Radiation	Air Temperature	Vapor Pressure	Wind Speed	Total
Spring	-0.14	0.63	0.01	-0.09	0.41
Summer	-0.11	0.25	-0.37	-0.17	-0.39
Fall	-0.03	0.16	-0.05	-0.33	-0.25
Winter	-0.01	0.15	0.00	0.06	0.21



Role of Lake Morphometry by Season

Fall