Climate and Lake Physics

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Progress since last meeting

- Lake Analyzer program made available on the web
- A few lakes were run through the program
- Initial explorations of sensitivity analyses
- Some updates to Lake Analyzer that help cross-lake comparisons
- Eleanor Jennings has draft of episodic events manuscript that includes several GLEON lake mixing examples – sets stage for moving forward with comparative analysis

Group Goals

1. Resolve questions for comparing stability across GLEON lakes
2. Determine a common format for data collection from group
3. Set path forward for analysis and manuscript production
4. Discuss protocols for data and information exchange
5. Authorship criteria
6. Other topics…

1. Resolve questions for comparing stability across GLEON lakes

- What is the magnitude, frequency and duration of mixing (or stratification) events across GLEON lakes?
- How do we measure sensitivity to mixing?

  - Quantity of hours at which a stability threshold is exceeded

  -What is threshold?

  -What is a disturbance? (for some polymictic lakes, disturbance could be being stable, instead of the other way around)

  -Lakes may have different important disturbance timescales (ex: duration vs intensity of wind forcing response time/duration of disturbance)

1. Resolve questions for comparing stability across GLEON lakes

- Need to work on normalizing stability calculations to enable fair comparisons across lakes of differing bathymetries; significant discussion on Schmidt stability (agreed to use Imberger & Patterson)

2. Determine a common format for data collection from group

- Requires at minimum 1 year of thermal profile (at least hourly or hourly average) and wind speed, relevant metadata and bathymetry.
- Lake Metadata
- Lake Analyzer input
  - Parameter file (bathymetry, anemometer ht)
  - Data file (hourly profiles, wind speed)

Lake Metadata

	Value	Units
Lake Name:		
Country		
Contact Name and e-mail:		
Mixing type:		
Latitude:		
Longitude:		
Area		
Max Depth		
Mean Depth		
Altitude		
Mean Annual Cumulative Precipitation		
Water retention time		
Mean Annual Air Temperature		
Min Air Termpature		
Max Air Termpature		
Height above lake surface of air temp recording		
Height above lake surface of anemometer		
Mean annual extinction coefficient		
Min Annual Extinction Coefficient		
Max Annual Extinction Coefficent		
Method of calculating extinction coefficient:		
Resolution of thermistor data for calculating hourly average		
Resolution of anemometer data for calculating hourly average		

Parameter file

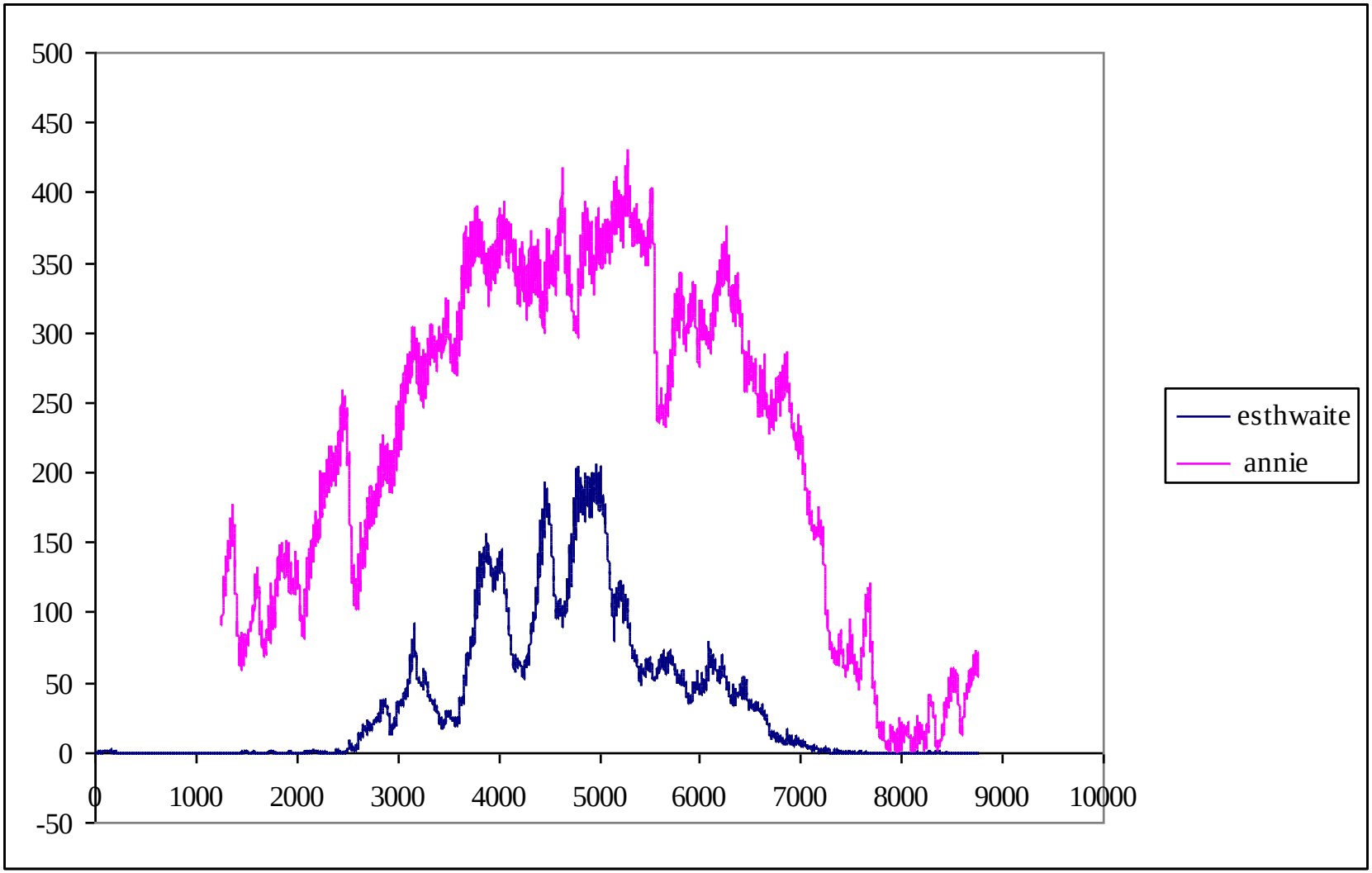
Bathymetry Heights (m)	Bathymetry Areas (m^2)	Total Depth (m)	Wind Height (m)	Temperature Depths (m)
18	315860	19	10	0
17	287990			1
16	260120			2
15	222960			3
14	185800			4
13	176510			5
12	157930			6
11	148640			7
10	130060			8
9	120770			9
8	111480			10
7	102190			11
6	92900			12
5	83610			13
4	74320			14
3	65030			15
2	37160			16
1	18580			17
0	9290			18

Data file

Date	Time	Temp0	Temp1	Temp2	Temp3	Temp4	Temp5	Temp6	Temp7	Temp8	Temp9	Temp10	Temp11	Temp12	Temp13	Temp14	Temp15	Temp16	Temp17	Temp18	windspd
39500	0.0	21.5	21.5	21.5	21.3	20.9	19.2	18.6	18.3	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.1
39500	0.0	21.5	21.5	21.5	21.4	21.0	19.3	18.7	18.3	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.2
39500	0.0	21.5	21.5	21.5	21.3	21.0	19.3	18.8	18.4	18.2	18.1	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.1
39500	0.0	21.5	21.5	21.5	21.4	21.0	19.2	18.8	18.4	18.2	18.1	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.1
39500	0.0	21.5	21.5	21.5	21.5	20.9	19.2	18.6	18.3	18.2	18.1	18.1	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.1
39500	0.1	21.5	21.5	21.5	21.5	21.0	19.2	18.6	18.3	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.2
39500	0.1	21.5	21.4	21.5	21.5	20.9	19.2	18.7	18.3	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.2
39500	0.1	21.4	21.4	21.4	21.4	20.7	19.5	18.8	18.3	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.3
39500	0.1	21.4	21.4	21.4	21.4	20.9	19.8	18.7	18.2	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.6
39500	0.1	21.4	21.4	21.4	21.4	20.4	19.5	18.9	18.3	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.8	17.9	1.7
39500	0.1	21.4	21.4	21.4	21.4	20.6	19.5	18.9	18.3	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.5
39500	0.1	21.4	21.4	21.4	21.4	20.8	19.4	18.8	18.3	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.8	17.8	1.5
39500	0.1	21.4	21.4	21.4	21.4	20.4	19.4	18.7	18.3	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.5
39500	0.1	21.4	21.4	21.4	21.4	20.4	19.4	18.6	18.2	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.4
39500	0.1	21.4	21.4	21.4	21.4	20.4	19.4	18.8	18.3	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.9	1.3
39500	0.2	21.4	21.4	21.3	21.4	20.6	19.3	18.8	18.3	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.8	17.9	17.8	1.3
39500	0.2	21.4	21.4	21.3	21.4	20.5	19.2	18.7	18.4	18.1	18.0	18.0	18.0	17.9	17.9	17.8	17.8	17.9	17.9	17.8	1.3
39500	0.2	21.3	21.4	21.3	21.4	20.6	19.7	18.7	18.4	18.1	18.0	18.0	18.0	17.9	17.9	17.8	17.8	17.9	17.9	17.8	1.2
39500	0.2	21.3	21.3	21.3	21.4	21.1	19.5	18.7	18.4	18.2	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.2
39500	0.2	21.3	21.3	21.3	21.3	20.7	19.4	18.7	18.3	18.1	18.0	18.0	18.0	17.9	17.9	17.9	17.8	17.9	17.9	17.8	1.1

3. Set path forward for analysis and manuscript production

- Lake Analyzer program updates – David H./Paul H./Ryan Kroiss (including modifications – excel macro - to enable common metalimnion definition, missing data routines)
- Collect datasets by end of February – Jordan and Ian
- Dataset QA/QC – Individuals/Jordan (new software with flags; standards - throw out long gaps, drop point rather than interp to hourly)
- Lake Analyzer/Visualization – Kohji/David H. (including updating and making available macro for visualization)
- Initial analysis – Ian
- Group communication on analytical approaches
- Incorporate heat budget concept? – (wind/convection – Sally M. & Rebecca)
- Draft preparation – all invited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9000
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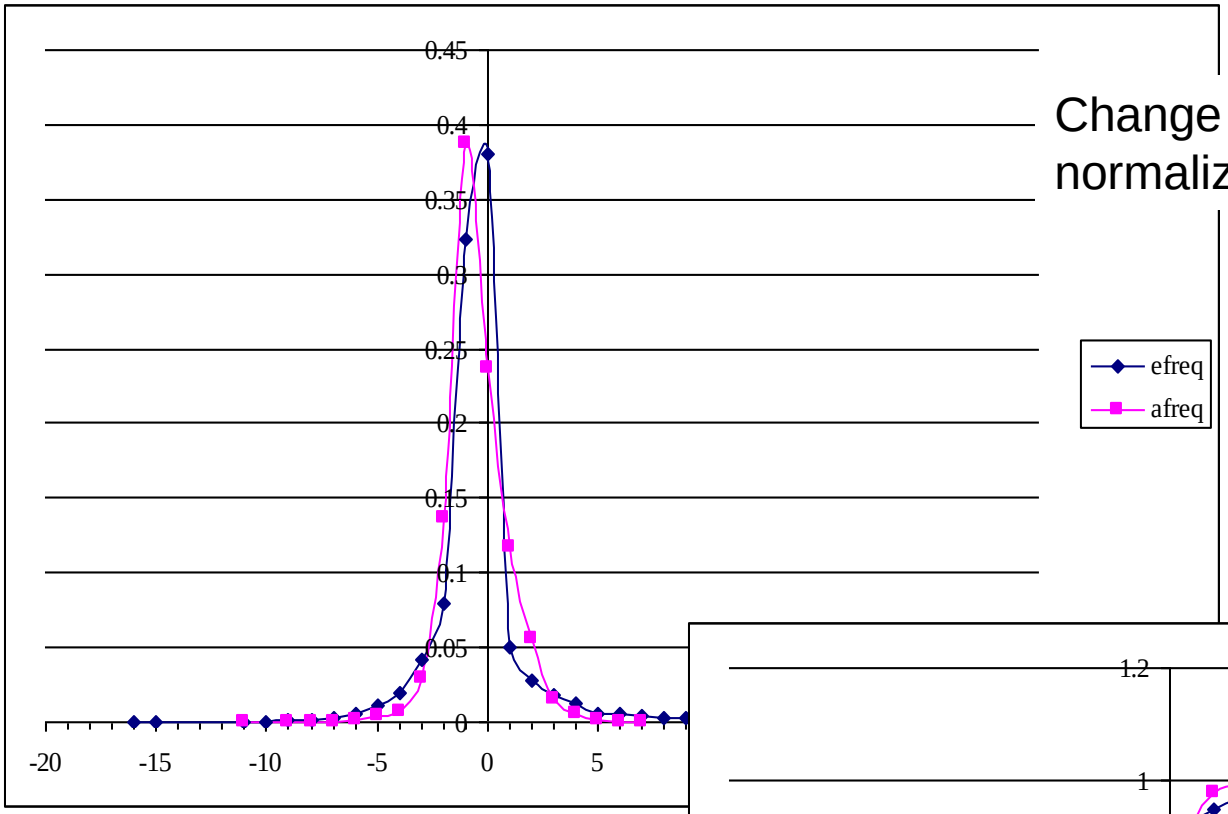
esthwaite
annie

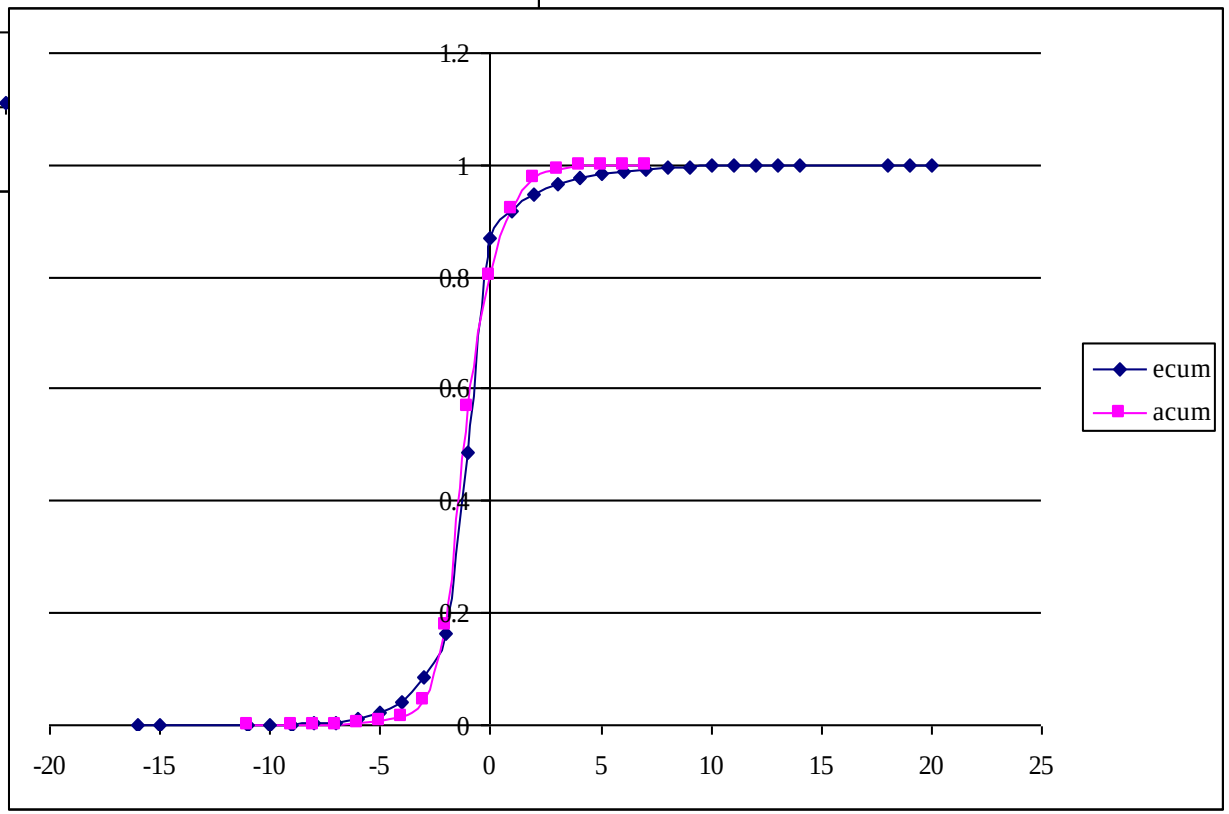
Lake list

- Taupo
- Rotorua
- Esthwaite
- Galten
- Ekoln
- Muggelsee
- Feagh
- Annie
- Trout Bog

- Sparkling
- Mendota
- Crystal
- Annie
- YYL
- Tahu
- Tanganika
- Sunapee
- Mangueira

Change in hourly stability normalized by mean stability





4. Discuss protocols for data and information exchange, authorship

- Data and participation solicited from GLEON membership
- All working group participants (present and past) and data contributors will be invited to participate
- Expect e-mail requesting your interest in receiving stability datasets for your (or all) lakes and desire to participate in analysis/writing
- Not a black box for your data! → Tangible intellectual contribution to products will be regularly requested and expected for authorship

5. Other topics…

- Discussed whether group should provide a “best practices” recommendation for physical data collection (some of this is in deployment reports – some specific recommendations included resolving thermistor drift with pressure transducers or anchored line, thermistor spacing should coincide with goals, standard height for wind speed, heat sensors (long and short wave) on booms to avoid buoy influence)
- DO at surface and bottom as an indicator of disturbance