

Physics/Climate Working Group Update

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Lake Analyzer

- Lake Analyzer:
 - *a numerical code coupled with supporting visualization tools which allows an automated procedure for determining indices used to describe the extent of mixing and stratification in lakes and reservoirs from high-resolution buoy data.*
- History
 - Developed in Hamilton, NZ
 - Updated through GLEON feedback
- Applications
 - Mixed layer depth, Lake Number, Schmidt Stability...many more
- Availability
 - Free for all GLEON members! (matlab)
 - Email Jordan for a copy (jsread@wisc.edu)

Lake Analyzer

Configuration File

Output options

- Buoyancy frequency
- Buoyancy frequency (parent)
- Lake Number
- Lake Number (parent)
- Metalimnion bottom
- Metalimnion bottom (parent)
- Metalimnion top
- Metalimnion top (parent)
- Mode 1 seiche period

Output selections

- Water temperature

Add **Remove**

User parameters

21600	output resolution (s)		total depth (m)
21600	wind averaging (s)		wind height (m)
21600	layer averaging (s)	21600	outlier window (s)
40	max water temp (°C)	-12	min water temp (°C)
98	max wind speed (m/s)	0	min wind speed (m/s)
0.1	metalimnion slope (kg/m4)	0.5	mixed temp differential (°C)
N	plot figure (Y/N)	Y	write results (Y/N)

AN.lke preview

Configuration file for AN

```
wTemp      #outputs
21600      #output resolution (s)
??         #total depth (m)
??         #height from surface for wind measurement (m)
21600      #wind averaging (s)
21600      #thermal layer averaging (s)
21600      #outlier window (s)
40         #max water temp (°C)  inf if none
-12        #min water temp (°C) -inf if none
98         #max wind speed (m/s)  inf if none
0          #min wind speed (m/s) -inf if none
0.1        #meta min slope (drho/dz per m)
0.5        #mixed temp differential (°C)
N          #plot figure (Y/N)
Y          #write results to file (Y/N)
```

load from existing? **Publish**

Lake Analyzer

Configuration File

Output options

- Mode 1 seiche period (parent)
- Schmidt Stability
- Thermocline depth
- Thermocline depth (parent)
- U-star
- U-star (parent)
- Wedderburn Number
- Wedderburn Number (parent)
- Wind speed

Output selections

- Water temperature

Add **Remove**

User parameters

21600	output resolution (s)		total depth (m)
21600	wind averaging (s)		wind height (m)
21600	layer averaging (s)	21600	outlier window (s)
40	max water temp (°C)	-12	min water temp (°C)
98	max wind speed (m/s)	0	min wind speed (m/s)
0.1	metalimnion slope (kg/m4)	0.5	mixed temp differential (°C)
N	plot figure (Y/N)	Y	write results (Y/N)

AN.lke preview

Configuration file for AN

```
wTemp #outputs
21600 #output resolution (s)
?? #total depth (m)
?? #height from surface for wind measurement (m)
21600 #wind averaging (s)
21600 #thermal layer averaging (s)
21600 #outlier window (s)
40 #max water temp (°C) inf if none
-12 #min water temp (°C) -inf if none
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0 #min wind speed (m/s) -inf if none
0.1 #meta min slope (drho/dz per m)
0.5 #mixed temp differential (°C)
N #plot figure (Y/N)
Y #write results to file (Y/N)
```

load from existing? **Publish**

Lake Analyzer

Configuration File

Output options

Output selections

- Buoyancy frequency
- Buoyancy frequency (parent)
- Lake Number
- Lake Number (parent)
- Metalimnion bottom
- Metalimnion bottom (parent)
- Metalimnion top
- Metalimnion top (parent)
- Mode 1 seiche period

Add **Remove**

User parameters

21600	output resolution (s)		total depth (m)
21600	wind averaging (s)		wind height (m)
21600	layer averaging (s)	21600	outlier window (s)
40	max water temp (°C)	-12	min water temp (°C)
98	max wind speed (m/s)	0	min wind speed (m/s)
0.1	metalimnion slope (kg/m4)	0.5	mixed temp differential (°C)
N	plot figure (Y/N)	Y	write results (Y/N)

AN.lke preview

Configuration file for AN

```
N2, SN2, Ln, SLn, metaB, SmetaB, metaT, SmetaT, T1, ST1, St, thermD,
SthermD, uSt, SuSt, wTemp, W, SW, wndSpd #outputs
21600 #output resolution (s)
?? #total depth (m)
?? #height from surface for wind measurement (m)
21600 #wind averaging (s)
21600 #thermal layer averaging (s)
21600 #outlier window (s)
40 #max water temp (°C) inf if none
-12 #min water temp (°C) -inf if none
98 #max wind speed (m/s) inf if none
0 #min wind speed (m/s) -inf if none
0.1 #meta min slope (drho/dz per m)
0.5 #mixed temp differential (°C)
N #plot figure (Y/N)
Y #write results to file (Y/N)
```

load from existing? **Publish**

Lake Analyzer

Configuration File

Output options

- Buoyancy frequency
- Buoyancy frequency (parent)
- Lake Number
- Lake Number (parent)
- Mode 1 seiche period
- Mode 1 seiche period (parent)
- Schmidt Stability
- U-star
- U-star (parent)

Output selections

- Metalimnion bottom
- Metalimnion bottom (parent)
- Metalimnion top
- Metalimnion top (parent)
- Thermocline depth
- Thermocline depth (parent)
- Water temperature

Add **Remove**

User parameters

3600	output resolution (s)	19	total depth (m)
3600	wind averaging (s)	10	wind height (m)
3600	layer averaging (s)	86400	outlier window (s)
40	max water temp (°C)	-10	min water temp (°C)
98	max wind speed (m/s)	0	min wind speed (m/s)
0.125	metalimnion slope (kg/m4)	0.75	mixed temp differential (°C)
N	plot figure (Y/N)	Y	write results (Y/N)

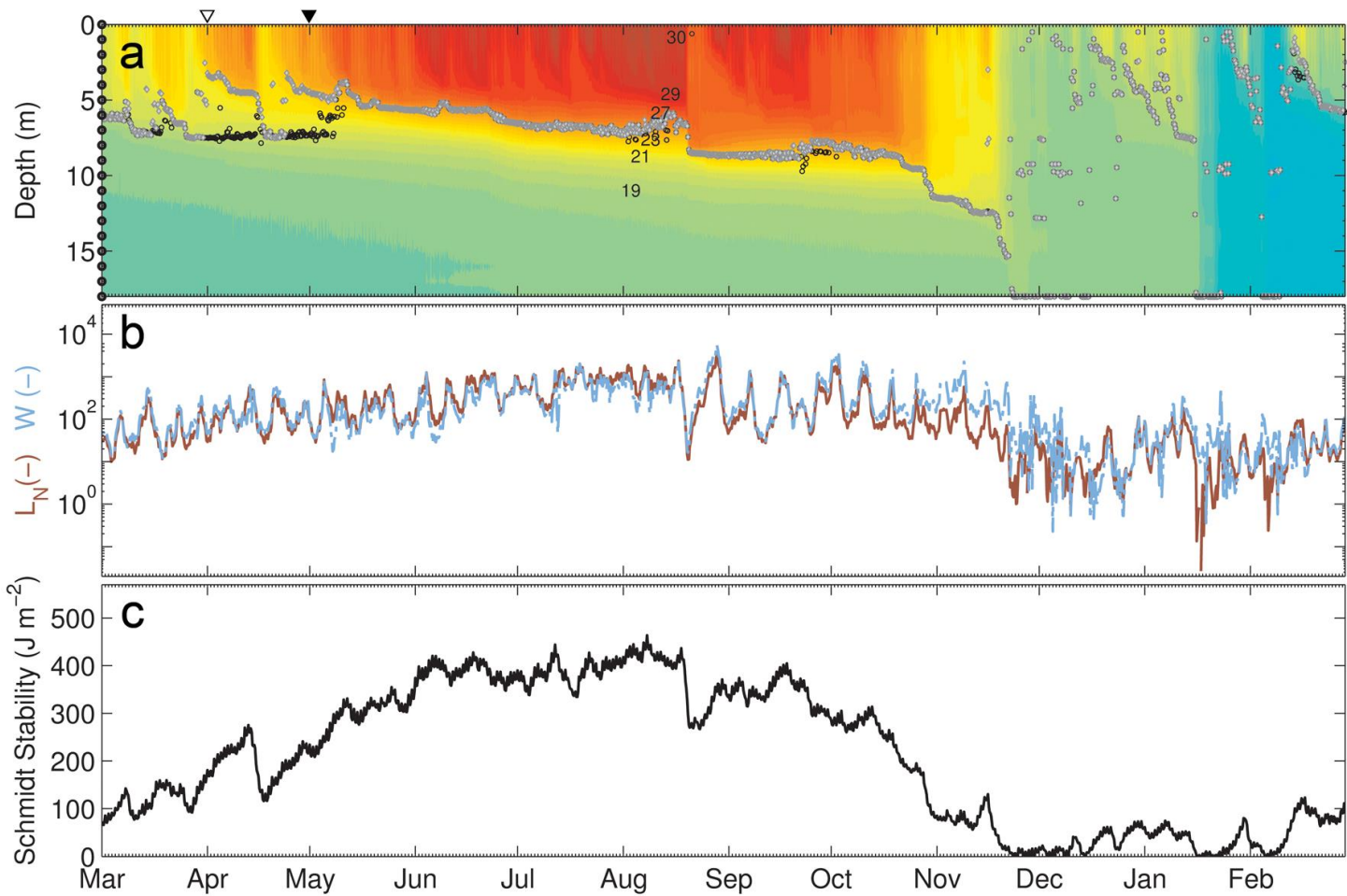
AN.lke preview

Configuration file for AN

```
metaB, SmetaB, metaT, SmetaT, thermD, SthermD, wTemp      #outputs
3600      #output resolution (s)
19        #total depth (m)
10        #height from surface for wind measurement (m)
3600      #wind averaging (s)
3600      #thermal layer averaging (s)
86400     #outlier window (s)
40        #max water temp (°C)  inf if none
-10       #min water temp (°C)  -inf if none
98        #max wind speed (m/s)  inf if none
0         #min wind speed (m/s)  -inf if none
0.125     #meta min slope (drho/dz per m)
0.75      #mixed temp differential (°C)
N         #plot figure (Y/N)
Y         #write results to file (Y/N)
```

load from existing? **Publish**

Results



Products

- **“Lake Analyzer”**: An automated program suite for the rapid analysis of high-resolution instrumented lake buoy data
 - Software release paper (*Environmental Modeling and Software*)
- **Untitled**
 - Global comparison of stability (12 lakes)

Physics/Climate Working Group Goals

- Continue to provide useful tools for buoy data analysis
 - Robyn Smyth/Ian Jones (heat budgets)
- Dissolve temporarily for GLEON 10?