/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

/\* Institute of Ecosystem Studies (Millbrook, NY) \*/

/\* \*/

/\* TITLE: Sunapee\_buoy\_data\_summary.sas \*/

/\* AUTHOR: Amanda Elliott \*/

/\* SYSTEM: Dell Vostro, Windows Vista, SAS 9.1 \*/

/\* DATE: 31Jan2008 \*/

/\* PROJECT: Lake Sunapee monitoring bouy \*/

/\* PURPOSE: Use raw buoy datalogger data as organized in \*/

/\* Sunapee\_buoy\_data\_input.sas to calculate summary \*/

/\* values for graphing purposes \*/

/\* \*/

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

/\* folder tree structure \*/

/\* \*/

/\* Lake Sunapee \*/

/\* | \*/

/\* monitoring \*/

/\* | \*/

/\* buoy data \*/

/\* \_\_\_\_\_\_\_\_\_/ | \\_\_\_\_\_\_\_\_\_ \*/

/\* / | \ \*/

/\* sas program files raw\_from\_gleon\_site temp\_SAS\_output \*/

/\* | | \*/

/\* \*.csv files exported \*/

/\* \*.xls files \*/

/\* \*/

/\* \*/

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

options ls=**100** ps=**52** pageno=**1**; \* when page orientation=portrait;

libname buoy "sasdatalibr";

\* NEED TO DEAL WITH THE CHANGE IN DEPTH DURING THE FALL OF 2007;

\* EASIEST WAY IS TO SPLIT THE RAW DATA FILES AND READ IN AS DIFFERENT

DEPTHS AND JUST HAVE MORE VARIABLES.;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\*\* daily averages \*\*;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\* calculate daily average temps and DO conc for graphing;

title 'daily\_avg\_temps';

**proc** **sort** data=buoy.Sunapee\_buoy\_data; by date; **run**;

**proc** **means** data=buoy.Sunapee\_buoy\_data noprint;

by date;

var temp0m\_C temp0p5m\_C temp1m\_C temp1p5m\_C temp2m\_C temp2p5m\_C temp3m\_C

temp4m\_C temp5m\_C temp6m\_C temp7m\_C temp8m\_C temp9m\_C temp10m\_C

temp11m\_C temp13m\_C temp15m\_C DO\_ppm;

output out=daily\_avg\_temps mean=;

**run**;

\*proc print data=daily\_avg\_temps; **run**;

**proc** **export** data=daily\_avg\_temps

outfile="temp\_SAS\_output\daily\_avg\_temps.xls" replace;

**run**;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\* calculate daily average wind direction;

title 'daily\_avg\_wd';

**data** daily\_avg\_wd1;

set buoy.Sunapee\_buoy\_data;

\* convert wind direction from degrees to radians;

wdrad=(wind\_dir\_deg\***0.017453**);

\* calculate the X and Y coordinates of each vector;

Y=wind\_spd\_ms\*sin(wdrad);

X=wind\_spd\_ms\*cos(wdrad);

**run**;

**proc** **sort** data=daily\_avg\_wd1; by date; **run**;

**proc** **means** data=daily\_avg\_wd1 noprint;

by date;

var Y X;

output out=mean\_XY mean=;

**run**;

\*proc print data=mean\_XY; **run**;

**data** daily\_avg\_wd;

set mean\_XY;

r=sqrt(((Y\*Y)+(X\*X)));

sina=Y/r;

cosa=X/r;

a=(arsin(sina));

b=(arcos(cosa));

adeg=a\***57.29674**;

if sina>**0** and cosa>**0** then do;

mean\_wd\_deg=adeg;

end;

if sina<**0** and cosa>**0** then do;

mean\_wd\_deg=**360**+adeg;

end;

if sina>**0** and cosa<**0** then do;

mean\_wd\_deg=**180**-adeg;

end;

if sina<**0** and cosa<**0** then do;

mean\_wd\_deg=**180**-adeg;

end;

keep date \_freq\_ mean\_wd\_deg;

**run**;

\*proc print data=daily\_avg\_wd; **run**;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\* calculate daily average met data;

title 'daily\_avg\_met';

**proc** **sort** data=buoy.Sunapee\_buoy\_data; by date; **run**;

**proc** **means** data=buoy.Sunapee\_buoy\_data noprint;

by date;

var temp\_air\_C PAR\_umolesm2s wind\_spd\_ms;

output out=daily\_avg\_met1 mean=;

**run**;

\*proc print data=daily\_avg\_met1; **run**;

**proc** **sort** data=daily\_avg\_met1; by date; **run**;

**proc** **sort** data=daily\_avg\_wd; by date; **run**;

\* merge average met data and wind direction data;

**data** daily\_avg\_met;

merge daily\_avg\_met1 daily\_avg\_wd;

by date;

**run**;

**proc** **export** data=daily\_avg\_met

outfile="temp\_SAS\_output\daily\_avg\_met.xls" replace;

**run**;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\* tabulate frequency of daily mean wind direction for rose graphing;

title 'daily\_wd\_freq';

**data** daily\_wd;

set daily\_avg\_wd;

if **0**<mean\_wd\_deg<**11.25** then wd\_category=**0**;

if **11.25**<mean\_wd\_deg<**33.75** then wd\_category=**22.5**;

if **33.75**<mean\_wd\_deg<**56.25** then wd\_category=**45**;

if **56.25**<mean\_wd\_deg<**78.75** then wd\_category=**67.5**;

if **78.75**<mean\_wd\_deg<**101.25** then wd\_category=**90**;

if **101.25**<mean\_wd\_deg<**123.75** then wd\_category=**112.5**;

if **123.75**<mean\_wd\_deg<**146.25** then wd\_category=**135**;

if **146.25**<mean\_wd\_deg<**168.75** then wd\_category=**157.5**;

if **168.75**<mean\_wd\_deg<**191.25** then wd\_category=**180**;

if **191.25**<mean\_wd\_deg<**213.75** then wd\_category=**202.5**;

if **213.75**<mean\_wd\_deg<**236.25** then wd\_category=**225**;

if **236.25**<mean\_wd\_deg<**258.75** then wd\_category=**247.5**;

if **258.75**<mean\_wd\_deg<**281.25** then wd\_category=**270**;

if **281.25**<mean\_wd\_deg<**303.75** then wd\_category=**292.5**;

if **303.75**<mean\_wd\_deg<**326.25** then wd\_category=**315**;

if **326.25**<mean\_wd\_deg<**348.75** then wd\_category=**337.5**;

if **348.75**<mean\_wd\_deg<**360** then wd\_category=**360**;

**run**;

**proc** **freq** data=daily\_wd noprint;

tables wd\_category /out=daily\_wd\_freq;

**run**;

**proc** **print** data=daily\_wd\_freq; **run**;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\*\* hourly averages \*\*;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\* calculate hourly average temps and DO conc for graphing;

title 'hourly\_avg\_temps';

**proc** **sort** data=buoy.Sunapee\_buoy\_data; by date hour; **run**;

**proc** **means** data=buoy.Sunapee\_buoy\_data noprint;

by date hour;

var temp0m\_C temp0p5m\_C temp1m\_C temp1p5m\_C temp2m\_C temp2p5m\_C temp3m\_C

temp4m\_C temp5m\_C temp6m\_C temp7m\_C temp8m\_C temp9m\_C temp10m\_C

temp11m\_C temp13m\_C temp15m\_C DO\_ppm;

output out=hourly\_avg\_temps1 mean=;

**run**;

**data** hourly\_avg\_temps;

set hourly\_avg\_temps1;

min=**0**;

sec=**0**;

datetime=DHMS(date,hour,min,sec);

format datetime datetime.;

drop date hour min sec \_type\_ \_freq\_;

**run**;

\*proc print data=hourly\_avg\_temps; **run**;

**proc** **export** data=hourly\_avg\_temps

outfile="temp\_SAS\_output\hourly\_avg\_temps.xls" replace;

**run**;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\* calculate hourly average wind direction;

title 'hourly\_avg\_wd';

**data** hourly\_avg\_wd1;

set buoy.Sunapee\_buoy\_data;

\* if wind speed is recorded as 0, set to a very small number

so in later calculations, we're not dividing by 0;

if wind\_spd\_ms=**0** then wind\_spd\_ms=**0.0001**;

\* convert wind direction from degrees to radians;

wdrad=(wind\_dir\_deg\***0.017453**);

\* calculate the X and Y coordinates of each vector;

Y=wind\_spd\_ms\*sin(wdrad);

X=wind\_spd\_ms\*cos(wdrad);

**run**;

**proc** **sort** data=hourly\_avg\_wd1; by date; **run**;

**proc** **means** data=hourly\_avg\_wd1 noprint;

by date hour;

var Y X;

output out=mean\_XY1 mean=;

**run**;

**proc** **print** data=mean\_XY1; **run**;

**data** hourly\_avg\_wd;

set mean\_XY1;

r=sqrt(((Y\*Y)+(X\*X)));

sina=Y/r;

cosa=X/r;

a=(arsin(sina));

b=(arcos(cosa));

adeg=a\***57.29674**;

if sina>**0** and cosa>**0** then do;

mean\_wd\_deg=adeg;

end;

if sina<**0** and cosa>**0** then do;

mean\_wd\_deg=**360**+adeg;

end;

if sina>**0** and cosa<**0** then do;

mean\_wd\_deg=**180**-adeg;

end;

if sina<**0** and cosa<**0** then do;

mean\_wd\_deg=**180**-adeg;

end;

keep date \_freq\_ mean\_wd\_deg hour;

**run**;

\*proc print data=hourly\_avg\_wd; **run**;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\* calculate hourly average met data;

title 'hourly\_avg\_met';

**proc** **sort** data=buoy.Sunapee\_buoy\_data; by date hour; **run**;

**proc** **means** data=buoy.Sunapee\_buoy\_data noprint;

by date hour;

var temp\_air\_C PAR\_umolesm2s wind\_spd\_ms;

output out=hourly\_avg\_met1 mean=;

**run**;

\*proc print data=hourly\_avg\_met1; **run**;

**proc** **sort** data=hourly\_avg\_met1; by date hour; **run**;

**proc** **sort** data=hourly\_avg\_wd; by date hour; **run**;

\* merge average met data and wind direction data;

**data** hourly\_avg\_met;

merge hourly\_avg\_met1 hourly\_avg\_wd;

by date hour;

min=**0**;

sec=**0**;

datetime=DHMS(date,hour,min,sec);

format datetime datetime.;

drop date hour min sec \_type\_ \_freq\_;

**run**;

**proc** **export** data=hourly\_avg\_met

outfile="temp\_SAS\_output\hourly\_avg\_met.xls" replace;

**run**;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\* tabulate frequency of hourly mean wind direction for rose graphing;

title 'hourly\_wd\_freq';

**data** hourly\_wd;

set hourly\_avg\_wd;

if **0**<mean\_wd\_deg<**11.25** then wd\_category=**0**;

if **11.25**<mean\_wd\_deg<**33.75** then wd\_category=**22.5**;

if **33.75**<mean\_wd\_deg<**56.25** then wd\_category=**45**;

if **56.25**<mean\_wd\_deg<**78.75** then wd\_category=**67.5**;

if **78.75**<mean\_wd\_deg<**101.25** then wd\_category=**90**;

if **101.25**<mean\_wd\_deg<**123.75** then wd\_category=**112.5**;

if **123.75**<mean\_wd\_deg<**146.25** then wd\_category=**135**;

if **146.25**<mean\_wd\_deg<**168.75** then wd\_category=**157.5**;

if **168.75**<mean\_wd\_deg<**191.25** then wd\_category=**180**;

if **191.25**<mean\_wd\_deg<**213.75** then wd\_category=**202.5**;

if **213.75**<mean\_wd\_deg<**236.25** then wd\_category=**225**;

if **236.25**<mean\_wd\_deg<**258.75** then wd\_category=**247.5**;

if **258.75**<mean\_wd\_deg<**281.25** then wd\_category=**270**;

if **281.25**<mean\_wd\_deg<**303.75** then wd\_category=**292.5**;

if **303.75**<mean\_wd\_deg<**326.25** then wd\_category=**315**;

if **326.25**<mean\_wd\_deg<**348.75** then wd\_category=**337.5**;

if **348.75**<mean\_wd\_deg<**360** then wd\_category=**360**;

**run**;

**proc** **freq** data=hourly\_wd noprint;

tables wd\_category /out=hourly\_wd\_freq;

**run**;

**proc** **print** data=hourly\_wd\_freq; **run**;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\*\* temperature profiles \*\*;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*;

\* choose temp values from noon one day per week for profile graphing;

title 'profile\_1day\_noon';

**data** profile\_1day\_noon;

set buoy.Sunapee\_buoy\_data;

dayofweek=weekday(date);

if dayofweek=**4** and time=**'12:00't**;

**run**;

\*proc print data=profile\_1day\_noon; **run**;

**proc** **export** data=profile\_1day\_noon

outfile="temp\_SAS\_output\profile\_1day\_noon.xls" replace;

**run**;