LTERcruise_UDAS_processing

Text output from the Pt. Sur Underway Data Acquisition System (UDAS) was stored on DVD for each cruise. The number of files stored and the column designations and instrument complements varied from cruise to cruise.

Raw text files concatenated into one file, manually cutting out the header lines separating each file. Date delimiters '/' were replaced with ','.
Time delimiters ':', were replaced with ','.
Column designations were documented for subsequent processing.
Text files were saved out with the name lter_nn_all_udas.txt (nn = cruise number);

The text files were had different sample intervals between cruises and, more interestingly, during an individual cruise. In addition to desiring a consistent output variable list for each cruise, the data were also 1 hour low pass filtered and interpolated onto a common 5 minute time base.
(see process_lternn_udas.m and Process_All_UDAS.m below for details)

Column designations for output *.mat and *.txt files
(ex. lternn_UDAS.mat, lternn_UDAS.txt):

1 Matlab serial time,
2 Datetime (yyyymmddHHMMSS)
3 North Latitude (furuno)
4 West Longitude (furuno)
5 North Latitude (ashtech)
6 West Longitude (ashtech)
7 DGPS flag
8 COG (degrees true)
9 SOG (knots)
10 Gyro heading (degrees true)
11 Wind dir starboard (degrees relative),
12 Wind speed starboard (knots relative)
13 Wind dir starboard (degrees true)
14 Wind speed starboard (knots true)
15 Wind dir port (degrees relative)
16 Wind speed port (knots relative)
17 Wind dir port (degrees true)
18 Wind speed port (knots true)
19 Air temp (C),
20 Barometric press (mBar)
21 Rel humidity (%)
22 Solar radiation (Watts/m^2)
23 SPAR (uE/m^2/sec)
24 PIR Pile volts
25 PIR Pile raw

26 PIR Pile longwave flux
27 SST (C), Conductivity (S/m)
28 Fluorescence (raw)
29 Transmissometer (volt)
30 beamC (1/m)
31 ISUS (volts)
    32 ISUS concentration (ug/l)

Example mfile (process_lternn_udas.m) reformatting .txt output for cruise 6:

```
cruise = 'lter06';
missing = 99999;


fid = fopen([cruise,'_all_udas.txt'],'r');
fmt = [repmat('%f',1,13),'%s%s',repmat('%f',1,27),'%*[^\n]'];
in = textscan(fid,fmt,'delimiter',',');
clear fmt
fclose all;

yyyy = in{3}+2000; yyyy(isnan(yyyy)) = 0;
mm = in{1};        mm(isnan(mm)) = 0;
dd = in{2};        dd(isnan(dd)) = 0;
HH = in{4};        HH(isnan(HH)) = 0;
MM = in{5};        HH(isnan(HH)) = 0;
SS = in{6};        HH(isnan(HH)) = 0;

out(:,1) = datenum(yyyy,mm,dd,HH,MM,SS);  % mtime
tgood = find(out(:,1)>datenum(2003,2,20) & out(:,1)<datenum(2003,3,10));
clear yyyy mm dd HH MM SS

out(:,2) = str2num(datestr(out(:,1),'yyyymmddHHMMSS'));


out(:,3) = in{10} + (in{11}./60);       % lat furuno
   ii = find(out(:,3)>37 | out(:,3)<33);
out(ii,3:4) = NaN;

out(:,4) = (in{12} + (in{13}./60)).*-1; % lon furuno
   ii = find(out(:,4)>-117 | out(:,4)<-123);
out(ii,3:4) = NaN;

   jlat = char(in{14});
   jlat(find(jlat(:,1)~='3'),:) = repmat('0',length(find(jlat(:,1)~='3')),size(jlat,2));
   jlatdeg = str2num(jlat(:,1:2));
```

```
    jlatdd = str2num(jlat(:,4:9));
out(:,5) = jlatdeg + (jlatdd./60); % lat ashtech
    ii = find(out(:,5)>37 | out(:,5)<33);
out(ii,5:6) = NaN;


    jlon = char(in{15});
    jlon(find(jlon(:,1)~='1'),:) = repmat('0',length(find(jlon(:,1)~='1')),size(jlon,2));
    jlondeg = str2num(jlon(:,1:3));
    jlondd = str2num(jlon(:,5:10));
out(:,6) = (jlondeg + (jlondd./60)).*-1; % lat ashtech
    ii = find(out(:,6)>-117 | out(:,6)<-123);
out(ii,5:6) = NaN;

out(:,7) = in{16}; % differential? (0/1)
out(:,8) = in{17}; % COG
out(:,9) = in{18};    out(out(:,9)>15,9) = NaN; % SOG
out(:,10) = in{19}; % gyro heading
out(:,11) = in{20}; % rel stbd wdir
out(:,12) = in{21}; % rel stb wspd
out(:,13) = in{22}; % true stb wdir
out(:,14) = in{23}; % tru stb wspd
out(:,15) = in{24}; % rel stbd wdir
out(:,16) = in{25}; % rel stb wspd
out(:,17) = in{26}; % true stb wdir
out(:,18) = in{27}; % tru stb wspd
out(:,19) = in{29}; % air temp (C)
out(:,20) = in{30}; % atm pressure (mbar)
out(:,21) = in{32}; % relative humidity
out(:,22) = in{33}; % solar radiation?
out(:,23) = in{42}; % SPAR
out(:,24) = nan(size(out,1),1); % no PIR V
out(:,25) = nan(size(out,1),1); % no PIR raw
out(:,26) = nan(size(out,1),1); % no PIR lw flux
out(:,27) = in{34}; % SST
out(:,28) = in{36}; % conductivity
out(:,29) = in{37}; % salinity
out(:,30) = in{35}; % fluor
out(:,31) = in{38}; % trans voltage
out(:,32) = in{40}; % beamC
out(:,33) = nan(size(out,1),1); % no ISUS volts
out(:,34) = nan(size(out,1),1); % no ISUS concentration

out = out(tgood,:);
out = sortrows(out,1);
```

```
udas = out;

save([cruise,'_UDAS.mat'],'udas');
clear udas


return
```

Example mfile (Process_All_UDAS.m) allowing batch processing of all individual cruise mfiles (above) along with filtering and interpolation steps:

```
clear all
close all
fclose all;

addpath /data01/pisco/ucsb/shared-files/transfer/Chris/mfile_library/

num = {'01';'02';'03';'04';'05';'06';'07';'08';'09';'10';'11';'12';'13';'14';'15';'16'};

for gg = 1:length(num)

   eval(['process_lter',num{gg},'_udas']);

   disp(['lter',num{gg},'_UDAS.txt']);

   fsamp = 1/(mean(diff(out(:,1)))*24); % calculate the 1/hourly sample interval for each
cruise

   % find suitable start and end points for the 5 min time base
   t_min = datevec(out(1,1));
   t_max = datevec(out(end,1));
   t_min = datenum(t_min(1),t_min(2), t_min(3),t_min(4)+1,0,0);
   t_max = datenum(t_max(1),t_max(2), t_max(3),t_max(4)-1,0,0);

   udas(:,1) = [t_min: 5/(60*24) : t_max]';
   udas(:,2) = str2num(datestr(udas(:,1),'yyyymmddHHMMSS'));
   udas(:,3:34) = nan(size(udas,1),32);


   junk = out;

   % 1 hour filter data columns and iterpolate onto common timebase
   col = [3:34];

   for cc = 1:length(col)
```

```
    if sum(isfinite(out(:,col(cc))))>0

        [out(:,col(cc)),nbad] = NaNgapfill(out(:,1),out(:,col(cc)));
        out(:,col(cc)) = filtfilt_data_filter(out(:,col(cc)),fsamp,1);
        out(nbad,col(cc)) = NaN;

        udas(:,col(cc)) = interp1q(out(:,1),out(:,col(cc)),udas(:,1));

    end


end % of cc column loop

save(['lter',num{gg},'_UDAS.mat'],'udas');

udas(isnan(udas)) = missing;  % replace nan with missing value code

fid = fopen(['lter',num{gg},'_UDAS.txt'],'w');
fmt = ['%12.5f, %14.0f, ', ...
  '%8.5f, %9.5f, %8.5f, %9.5f, ', ...
  '%1.0f, %5.1f, %4.1f, %5.1f, ', ...
  '%5.1f, %4.1f, %5.1f, %4.1f, %5.1f, %4.1f, %5.1f, %4.1f, ', ...
  '%5.2f, %7.2f, %4.1f, %6.1f, %6.1f, %5.2f, %5.1f, %7.2f, ', ...
  '%5.2f, %5.3f, %6.3f, %6.3f, %6.3f, %6.3f, %6.3f, %6.3f\n'];

fprintf(fid,'%s\n', ...
['Matlab serial time, Datetime (yyyymmddHHMMSS), ', ...
 'North Latitude (furuno), West Longitude (furuno), ', ...
 'North Latitude (ashtech), West Longitude (ashtech), ', ...
 'DGPS flag, COG (degrees true), SOG (knots), Gyro heading (degrees true), ', ...
 'Wind dir starboard (degrees relative), Wind speed starboard (knots relative), ', ...
 'Wind dir starboard (degrees true), Wind speed starboard (knots true), ', ...
 'Wind dir port (degrees relative), Wind speed port (knots relative), ', ...
 'Wind dir port (degrees true), Wind speed port (knots true), ', ...
 'Air temp (C), Barometric press (mBar), Rel humidity (%), Solar radiation
(Watts/m^2), ', ...
 'SPAR (uE/m^2/sec), PIR Pile volts, PIR Pile raw, PIR Pile longwave flux, ', ...
 'SST (C), Conductivity (S/m), Fluorescence (raw), Transmissometer (volt), beamC
(1/m), ISUS (volts), ISUS concentration (ug/l)']);

fprintf(fid,fmt,udas');

clear out udas jl* ii in tgood cruise

fclose all;
```

end % of gg cruise loop