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```
%
%Script to read and process runs from the Perkin Elmer CHN 2400
% element analyzer. The code calculates C & N content on sample
% filter replicates
clear
close all

% Data info

cruise = 'F06'; %enter here cruise or campaign code

airs=1; % Number of air blanks run at the beginning of run prep
```

## Open Data File that contains analysis report from CHN instrument

---

```
filename = uigetfile('/Users/joaquin/Documents/CVO/Lab stuff/POC/Runs/*.csv',...
    'Select CHN run file');

fid = fopen(filename);

C_text = textscan(fid, '%s', 11, 'delimiter', ',');

C_data = textscan(fid, '%s %f %f %s %f %f %f %f %f %f %f', 'delimiter', ',');

fclose(fid);
```

## Assign variable names to data columns

```
names = C_text{1};

id      = C_data{1};
seq     = C_data{2};
weight  = C_data{3};
time    = C_data{4};
carbon  = C_data{5};
hydrogen = C_data{6};
nitrogen = C_data{7};
zr      = C_data{8};
cr      = C_data{9};
hr      = C_data{10};
nr      = C_data{11};
```

## Indexing

```
%Find index for each type of run (i.e., K factors, blanks,...
%   ref material, filter blanks, sample, etc

K1s      = find((strcmp(id,'K1')==1));           %index of K factors calibration ...
                                                %runs (i.e., acetanilide cal runs)
blanks   = find((strcmp(id,'BLANK')==1));       %index of analytical cal blanks
f_blks   = find((strcmp(id,'TEST')==1));       %index of filter, "method blanks"
buff     = find((strcmp(id,'BUFF')==1));       %index of Buffalo River sediment runs
ace      = find((strcmp(id,'ACE')==1));        %index of acetanilide check standards

cals     = [K1s; blanks];                      %index of cal runs
stds     = [buff; ace];                       %index of standard & check runs

length_run = size(id,1);
run        = 1:length_run;

samples   = setdiff(run, [cals; stds; f_blks]); %index of sample runs

non_cal   = setdiff(run, cals);
```

## Instrument signals for each element

```
%Carbon                                     % Carbon signal [i.e., C read (cr)-N read (nr)]
%Blanks
CBS=cr(blanks)-nr(blanks); % C blanks

CB=mean(CBS(1:end-airs)); % Mean C blanks, except air blanks
% (run report runs chron. bottom to top)

CS = (cr - nr)-CB; % Carbon signals (i.e. C read - N read)

%Nitrogen                                     % Nitrogen signal [i.e., N read (nr)-zero read (zr)]
%Blanks
NBS=nr(blanks)-zr(blanks); % N blanks
```

```

NB=mean(NBS(1:end-airs)); % Mean N blanks, except air blanks

NS = (nr - zr)-NB; % Nitrogen signals (i.e. N read - zero read)

```

## Run calibration curves

### Carbon -- Amount of C in mg for K1 (acetanilide) runs

```

K1_C = (71.09/100).*weight(K1s); %mg C per K1 run

% Linear regression of K1_C as a f(x) of C signal, CS.

x = CS(K1s);
y = K1_C;

xx = union(0,x);

C_model = polyfit(x,y,1); %Ace std C vs C signal linear fit
z = polyval(C_model,xx);

```

### Plot Carbon Calibration curve

```

f = figure('Position',[2000 1000 550 550]);
subplot(2,1,1);
plot(x,K1_C,'o')
    grid on
    hold on

    title([cruise ' cruise, CHN Run Calibration Curves'], 'FontSize', 17);

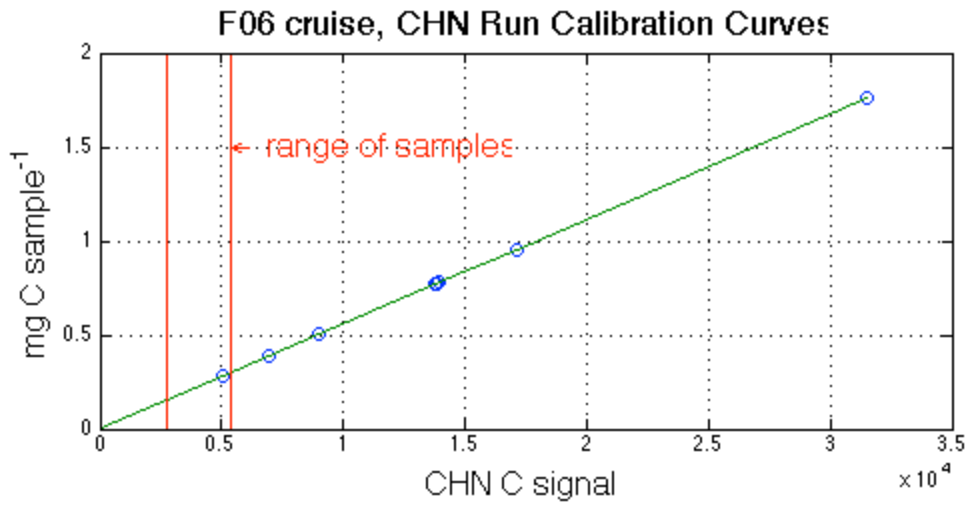
plot(x,y,'o', xx,z, '-')
    ylabel('mg C sample^{-1}','FontSize',16)
    xlabel('CHN C signal', 'FontSize', 16)

aa=get(gca,'xlim');
bb=get(gca,'ylim');

vline([max(CS(samples)), min(CS(samples))], 'r') %vert red lines
                                                %enclose sample
                                                %range

text(max(CS(samples)),bb(2)*.75,'\leftarrow range of samples',...
     'color','r','FontSize', 16)

```



### C regression statistics

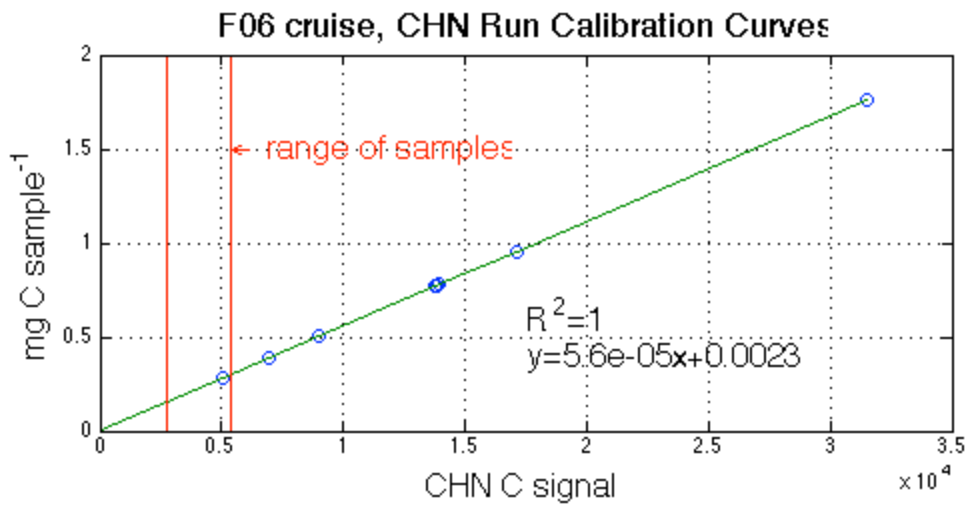
```

X =[ones(size(x,1),1) x];
[b,bint,r,rint,stats] = regress(y,X);

% Display R^2 & regression eq on cal curve plot
text(aa(2)*.5,bb(2)*.3,['R^{2}=' num2str(stats(1),4)],'fontsize',16)
text(aa(2)*.5,bb(2)*.2,['y=' num2str(b(2),2) 'x+' num2str(b(1),2)],'fontsize',16)

hold off

```



### Nitrogen -- Amount of C in mg for K1 runs

```

K1_N = (10.36/100).*weight(K1s); %mg N per K1 run

% Linear regression of K1_N as a f(x) of N signal, NS.

x = NS(K1s);
y = K1_N;

```

### Linear regression of std\_N as a f(x) of NR signal

```

nx = NS(K1s);
ny = K1_N;

nxx = union(0,nx);

N_model = polyfit(nx,ny,1);
nz = polyval(N_model,nxx);

```

```

subplot(2,1,2);
plot(nx,K1_N,'o')
    grid on
    hold on

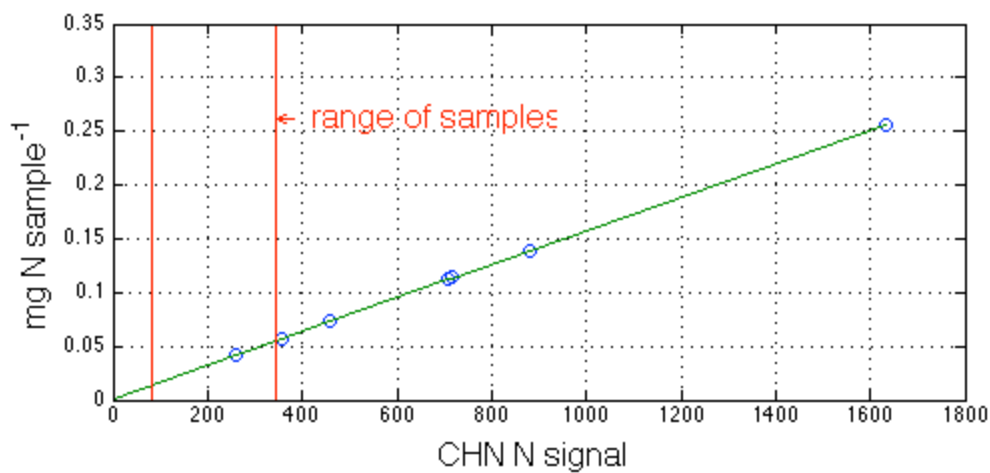
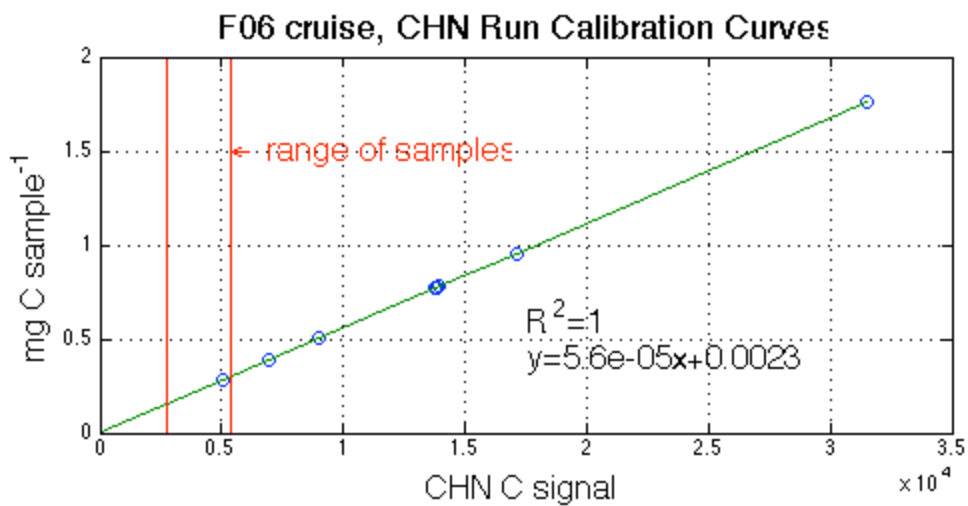
plot(nx,ny,'o', nxx,nz ,'-')
    ylabel('mg N sample^{-1}','FontSize',16)
    xlabel('CHN N signal', 'FontSize', 16)

    aa=get(gca,'xlim');
    bb=get(gca,'ylim');

vline([max(NS(samples)), min(NS(samples))], 'r')           %vert red lines
                                                         %enclose sample
                                                         %range

text(max(NS(samples)),bb(2)*.75, '\leftarrow range of samples',...
     'color','r','FontSize', 16)

```



## N regression statistics

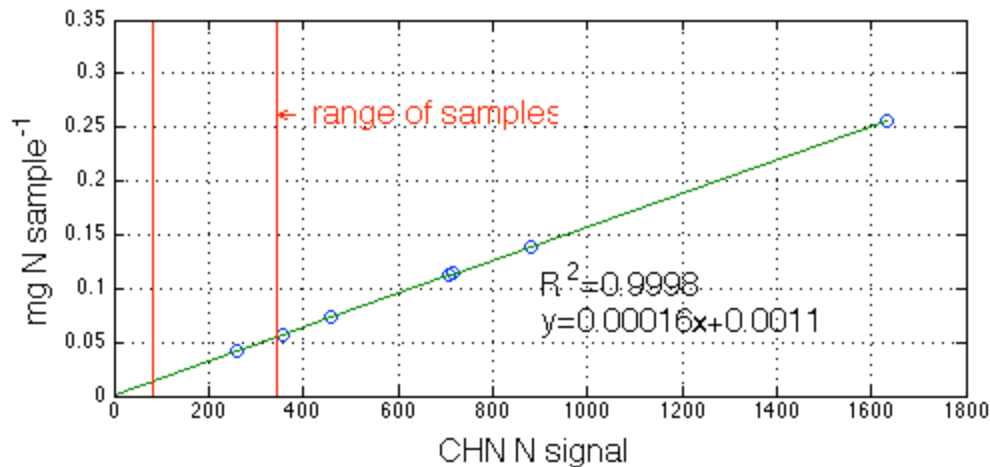
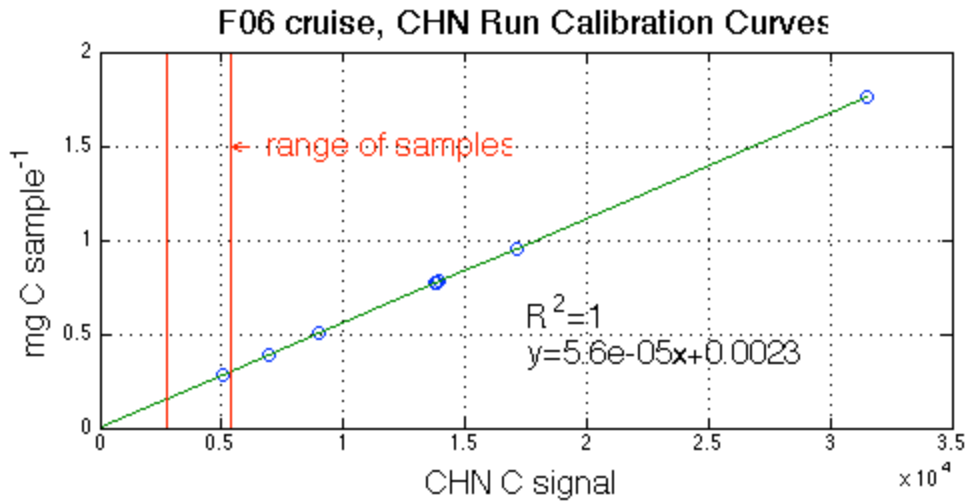
```

NX =[ones(size(x,1),1) nx];
[n_b,n_bint,n_r,n_rint,n_stats] = regress(ny,NX);

% Display R^2 & regression eq on cal curve plot
text(aa(2)*.5,bb(2)*.3,['R^2=' num2str(n_stats(1),4)],'fontsize',16)
text(aa(2)*.5,bb(2)*.2,['y=' num2str(n_b(2),2) 'x+' num2str(n_b(1),2)],'fontsize',16)

hold off

```



### C and N (in mg) in filter samples and filter blanks

```

mgC = polyval(C_model,CS(samples)); %C in samples, mg, not corrected for filter blank
mgC_b = polyval(C_model,CS(f_blks)); %C in filter blank

```

### Blank corrections

```

if(mean(mgC_b)>0) % C filter blank correction if > 0

```





	Sample_ID	C, mg	N, mg
1	9	0.1539	0.0130
2	15	0.2011	0.0249
3	13	0.2906	0.0398
4	1	0.2378	0.0296
5	3	0.1955	0.0188
6	16	0.1728	0.0202
7	18	0.2991	0.0534
8	14	0.2592	0.0327
9	2	0.2188	0.0293
10	8	0.1787	0.0155
11	11	0.1950	0.0235
12	17	0.2428	0.0312
13	7	0.1771	0.0191
14	12	0.2220	0.0258
15	10	0.1620	0.0153
16	6	0.1699	0.0139
17	5	0.1566	0.0147
18	4	0.1993	0.0191

## QA/QC

```

% Carbon percent error based on Buffalo River runs
  %NIST certified C % content in Buff R. sed. is 3.51%

%Buffalo River Sediment Ref stds
mgC_buff=polyval(C_model,CS(buff)); % measured C in Buff stds

mgC_buff_t=.0351*weight(buff);          % expected C in Buff stds

%ACE check stds
mgC_ace=polyval(C_model,CS(ace)); % measured C in ACE chk stds

mgC_ace_t=.7109*weight(ace);          % expected C in ACE chk stds

figure('Position',[2000 100 350 650]);

subplot(2,1,1)

plot(mgC_buff_t,mgC_buff,'o')
  grid on
  hold on

a=max(get(gca,'xlim'));
  set(gca,'xlim',[0 a]);

```

```

    set(gca, 'ylim', [0 a]);
    line([0 a],[0 a], 'color', 'r')

xlabel('Buff R. sed. exp. Carbon, mg', 'fontsize', 15)
ylabel('Buff R. sed. meas. Carbon, mg', 'fontsize', 15)

error=errperf(mgC_buff_t,mgC_buff, 'rmspe');

text(a*.5,a*.2, ['RMSE%= ' num2str(error,2)], 'fontsize', 17)

title(['NIST Buffalo River Sediment Stds., ' cruise ' cruise'],...
      'fontsize', 15)

subplot(2,1,2)

plot(mgC_ace_t,mgC_ace, 'o')
    grid on
    hold on

a=max(get(gca, 'xlim'));
    set(gca, 'xlim', [0 a]);
    set(gca, 'ylim', [0 a]);
    line([0 a],[0 a], 'color', 'r')

xlabel('Acetanilide Chk Stds., exp. Carbon, mg', 'fontsize', 15)
ylabel('Acetanilide Chk Stds., meas. Carbon, mg', 'fontsize', 15)

error=errperf(mgC_ace_t,mgC_ace, 'rmspe');

text(a*.5,a*.2, ['RMSE%= ' num2str(error,2)], 'fontsize', 17)

title(['Acetanilide Chk Stds., ' cruise ' cruise'],...
      'fontsize', 15)
    hold off

```

