Contents

```
%%script to plot data from hand measurements of cohesive flume experiments
clear all
close all
```

import data

```
%each dataset columns go as: 0time, 0width/headcut, 1time, 1 width/headcut,
%etc.
width = importdata('cohesion_width_data_avg_hand_measured.csv');
headcut = importdata('cohesion_headcut_hand_measured.csv');

%make array for looping through time
cols = 1:4:24;
```

Width calculations

```
%make plot of average width through time
%make array for looping through time

markerStyles = {'o','s','d','^','p','x','v','x'};
colors = orderedcolors('meadow');
figure;

for j = 1:length(cols)
    i = cols(j);

    time_measurements = width.data(:, i);
    width_measurements = width.data(:, i + 1);

    good_indices = find(time_measurements > -1);
    time_measurements = time_measurements(good_indices);
    width_measurements = width_measurements(good_indices);

    hold on;
    plot(time_measurements, width_measurements,'Color', colors(j, :), 'Marker', markerStyles{j},'LineWidth',1,'MarkerSize', 6,'LineStyle','none');
end
hold off;
set(0, 'DefaultAxesFontName', 'TimesNewRoman');
legend('0%X.G.','0.1%X.G.','0.2%X.G.','0.3%X.G.','0.4%X.G.','0.5%X.G.');
xlabel('Time [minutes]','FontSize',12,'FontWeight','normal');
ylabel('Spatially averaged channel bank width [cm]','FontSize',12,'FontWeight','normal');
set(gca,'FontSize',12);
grid on;
grid minor;
box on;
saveas(gcf, 'bankwidths_time_figure.png');
```

plot time and space averaged width vs. %XG (did not run this part)

```
figure
xg = [0,0.1,0.2,0.3,0.4,0.5];
avg_width_0 = nanmean(width.data(:,2));
avg_width_1 = nanmean(width.data(:,6));
avg_width_2 = nanmean(width.data(:,10));
avg_width_3 = nanmean(width.data(:,14));
avg_width_4 = nanmean(width.data(:,18));
avg_width_5 = nanmean(width.data(:,22));

avg_widths = [avg_width_0,avg_width_1,avg_width_2,avg_width_3,avg_width_4,avg_width_5];

plot(xg,avg_widths,'.',MarkerSize=20)
xlabel('%XG')
ylabel('Space and time averaged width')
```

```
%make array for looping through time
cols = 1:2:11;
```

headcut calculations (for 0.2-0.5%XG)

```
cols = 1:2:7;
markerStyles = {'o','s','d','^','p','x','v','x'};
colors = orderedcolors('meadow');
figure;

for j = 1:length(cols)
    i = cols(j);


    %pull data for each %XG in loop
    %find non-nan data
    good_indices=find(headcut.data(:,i)>-1);

    time_measurements = headcut.data(:,i);
    headcut_measurements = headcut.data(:,i+1);

    headcut_measurements = headcut_measurements(good_indices);
    time_measurements = time_measurements(good_indices);


    %attempt fitting powerlaw
    % logtime = log(time_measurements);
    % log_headcut = log(headcut_measurements);
    % curve_fit = fit(time_measurements, headcut_measurements, 'exp1');

    %plot width through time
    hold on;
    plot(time_measurements, headcut_measurements,'Color', colors(j, :), 'Marker', markerStyles{j},'LineWidth',1,'MarkerSize', 6,'LineStyle','none');
end
hold off;
set(0, 'DefaultAxesFontName', 'TimesNewRoman');
legend('0.2%X.G.','0.3%X.G.','0.4%X.G.','0.5%X.G.');
xlabel('Time [minutes]','FontSize',12,'FontWeight','normal');
ylabel('Headcut Location [cm upstream from outlet]','FontSize',12,'FontWeight','normal');
set(gca,'FontSize',12);
grid on;
grid minor;
box on;
saveas(gcf, 'headcut_time_figure.png');
```

supplementary width plots with stdev error bars

```
%make plot of average width through time
figure;
cols = 1:4:24;

markerStyles = {'o','s','d','^','p','x','v','x'};
colors = orderedcolors('meadow');
figure;

for j = 1:length(cols)
    i = cols(j);

    %pull data for each %XG in loop
    time_measurements = width.data(:,i);
    width_measurements = width.data(:,i+1);
    stdev= width.data(:,i+2);
    sem= width.data(:,i+3);

    %find non-nan data
    good_indices=find(width.data(:,i)>-1);

    width_measurements = width_measurements(good_indices);
    time_measurements = time_measurements(good_indices);
    stdev = stdev(good_indices);
    sem = sem(good_indices);


    %plot width through time with stdev
    errorbar(time_measurements,width_measurements,stdev,'Color', colors(j, :), 'Marker', markerStyles{j},'LineWidth',1,'MarkerSize', 6,'LineStyle','none');
    hold on
end
hold off;
```

```
set(0, 'DefaultAxesFontName', 'TimesNewRoman');
legend('0%X.G.','0.1%X.G.','0.2%X.G.','0.3%X.G.','0.4%X.G.','0.5%X.G.');
xlabel('Time [minutes]','FontSize',12,'FontWeight','normal');
ylabel('Spatially averaged channel bank width [cm]','FontSize',12,'FontWeight','normal');
set(gca,'FontSize',12);
grid on;
grid minor;
box on;
%title('Errorbars show standard deviation');
saveas(gcf, 'bankwidths_time_errorbar_figure.png');
```

plot time and space averaged width vs. %XG

```
set(0, 'DefaultAxesFontName', 'TimesNewRoman');
markerStyles={'ko','ks','kd','k^','kp','kx','k+','kv','k>','k<'};
figure;
xg = [0,0.1,0.2,0.3,0.4,0.5];
avg_width_0 = nanmean(width.data(:,2));
stdev_0 = 2.994286481;
sem_0 = 0.308837069;
avg_width_1 = nanmean(width.data(:,6));
stdev_1 =2.950285021;
sem_1 =0.22366053;
avg_width_2 = nanmean(width.data(:,10));
stdev_2 =0.74996184;
sem_2=0.058208328;
avg_width_3 = nanmean(width.data(:,14));
stdev_3=0.539097613;
sem_3=0.041716626;
avg_width_4 = nanmean(width.data(:,18));
stdev_4=0.826405024;
sem_4 =0.078794627;
avg_width_5 = nanmean(width.data(:,22));
stdev_5=0.212743368;
sem_5=0.023493575;



avg_widths = [avg_width_0,avg_width_1,avg_width_2,avg_width_3,avg_width_4,avg_width_5];
stdevs = [stdev_0,stdev_1,stdev_3,stdev_3,stdev_4,stdev_5];
sems = [sem_0,sem_1,sem_2,sem_3,sem_4,sem_5];

figure;
errorbar(xg,avg_widths,stdevs,'k', 'LineStyle', 'none', 'LineWidth', 1,'HandleVisibility', 'off');
hold on;
plot(xg(1),avg_width_0,'ko','LineWidth',1.2,'LineStyle','none','MarkerSize',6,'DisplayName','0% XG');
plot(xg(2),avg_width_1,'ks','LineWidth',1.2,'LineStyle','none','MarkerSize',6,'DisplayName','0.1% XG');
plot(xg(3),avg_width_2,'kd','LineWidth',1.2,'LineStyle','none','MarkerSize',6,'DisplayName','0.2% XG');
plot(xg(4),avg_width_3,'k^','LineWidth',1.2,'LineStyle','none','MarkerSize',6,'DisplayName','0.3% XG');
plot(xg(5),avg_width_4,'kp','LineWidth',1.2,'LineStyle','none','MarkerSize',6,'DisplayName','0.4% XG');
plot(xg(6),avg_width_5,'kx','LineWidth',1.2,'LineStyle','none','MarkerSize',6,'DisplayName','0.5% XG');
hold off;
set(gca,'FontSize',12);
xlabel('%XG');
ylabel('Space and Time Averaged Width (cm)','FontSize',12,'FontWeight','normal');
%title('Errorbars show standard deviation','FontSize',12,'FontWeight','normal');
grid on;
grid minor;
box on;
saveas(gcf, 'bankwidths_time_stdv_figure.png');
```

```
figure;
errorbar(xg,avg_widths,sems,'k', 'LineStyle', 'none', 'LineWidth', 1,'HandleVisibility', 'off');
hold on;
plot(xg(1),avg_width_0,'ko','LineWidth',1.2,'LineStyle','none','MarkerSize',6,'DisplayName','0% XG');
plot(xg(2),avg_width_1,'ks','LineWidth',1.2,'LineStyle','none','MarkerSize',6,'DisplayName','0.1% XG');
plot(xg(3),avg_width_2,'kd','LineWidth',1.2,'LineStyle','none','MarkerSize',6,'DisplayName','0.2% XG');
plot(xg(4),avg_width_3,'k^','LineWidth',1.2,'LineStyle','none','MarkerSize',6,'DisplayName','0.3% XG');
plot(xg(5),avg_width_4,'kp','LineWidth',1.2,'LineStyle','none','MarkerSize',6,'DisplayName','0.4% XG');
plot(xg(6),avg_width_5,'kx','LineWidth',1.2,'LineStyle','none','MarkerSize',6,'DisplayName','0.5% XG');
hold off;
set(gca,'FontSize',12);
xlabel('%XG');
ylabel('Space and Time Averaged Width (cm)','FontSize',12,'FontWeight','normal');
grid on;
grid minor;
box on;
```

```
%title('Errorbars show standard error of mean');
saveas(gcf, 'bankwidths_time_sem_figure.png');
```

Published with MATLAB® R2023b