Appendix A

```
clear all
clc
clf

%% Loading the files
Max = [];
Min = [];
Temp = [];
Amp = [];
Max(1,:) = load('BollerupMax.txt');
Min(1,:) = load('BollerupMin.txt');
Temp(1,:) = load('Bolleruptemp.txt');
Max(2,:) = load('BredakraMax.txt');
Min(2,:) = load('BredakraMin.txt');
Temp(2,:) = load('Bredakratemp.txt');
Max(3,:) = load('FalsterboMax.txt');
Min(3,:) = load('FalsterboMin.txt');
Temp(3,:) = load('Falsterbotemp.txt');
Max(4,:) = load('HarnoMax.txt');
Min(4,:) = load('HarnoMin.txt');
Temp(4,:) = load('Harnosandtemp.txt');
Max(5,:) = load('KarlshamnMax.txt');
Min(5,:) = load('KarlshamnMin.txt');
Temp(5,:) = load('Karlshamntemp.txt');
Max(6,:) = load('LaxMax.txt');
Min(6,:) = load('LaxMin.txt');
Temp(6,:) = load('Laxtemp.txt');
Max(7,:) = load('LulMax.txt');
Min(7,:) = load('LulMin.txt');
Temp(7,:) = load('Lultemp.txt');
Max(8,:) = load('OxelMax.txt');
Min(8,:) = load('OxelMin.txt');
Temp(8,:) = load('Oxeltemp.txt');
Max(9,:) = load('SatMax.txt');
Min(9,:) = load('SatMin.txt');
Temp(9,:) = load('Sattemp.txt');
Max(10,:) = load('SundMax.txt');
Min(10,:) = load('SundMin.txt');
Temp(10,:) = load('Sundtemp.txt');

%% Counting the number of records
num = 10;                    %num-number of stations
a = zeros(1,num);
b = zeros(1,num);
v = zeros(1,num);
k = zeros(1,num);
recv = zeros(num,30);
reck = zeros(num,30);
```

```
for i = 1:num
    a(i) = Max(i,1);
    b(i) = Min(i,1);
end
for i = 2:length(Max(1,:))
    for j = 1:num
        if Max(j,i)>a(j)
            v(j) = v(j)+1;
            a(j) = Max(j,i);
            recv(j,v(j)) = i;
        end
        if Min(j,i)<b(j)
            k(j) = k(j)+1;
            b(j) = Min(j,i);
            reck(j,k(j)) = i;
        end
    end
end


%% Making a matrix with the average maximum temperature and
the average minumum temperature for each year
% and counting the number of records each year
y = 1961;
counter = 1;
year = [];
yea = 50;
ave = zeros(num,yea,3);

recvpy = zeros(50,num,30);
reckpy = zeros(50,num,30);
apy = zeros(50,num);                %placeholder for varm
bpy = zeros(50,num);                %placeholder for cold
vpy = zeros(50,num);                %varm records per year
kpy = zeros(50,num);                %cold records per year
ratios = zeros(50,num);
averageratios = zeros(50,1);
month = [31;28;31;30;31;30;31;31;30;31;30;31];
monthave = zeros(50,12,3,num+1);    %monthave(year,month,min-
max-ave,station(11th is all averaged))
for i = 1:yea
    year(i,1) = y;
    year(i,2) = 365;
    for j=1:num
        s1 = Max(j,(i-1)*365+counter:i*365-1+counter);
        s1 = sum(s1)/length(s1);
        s2 = Min(j,(i-1)*365+counter:i*365-1+counter);
        s2 = sum(s2)/length(s2);
        s3 = Temp(j,(i-1)*365+counter:i*365-1+counter);
        s3 = sum(s3)/length(s3);
```

```
        ave(j,i,1) = s1;
        ave(j,i,2) = s2;
        ave(j,i,3) = s3;          %ave(station,year,max-min-ave)
    end
    if rem(i,4)==0
        year(i,2) = 366;
        counter = counter+1;
        month(2) = 29;
    else
        month(2) = 28;
    end
    if i == 1
        w = 1;
    else
        w = sum(year(1:i-1,2))+1;
    end
    for t = 1:12
        m = w-1+sum(month(1:t));
        if t == 1
            e = w;
        else
            e = w+sum(month(1:t-1));
        end
        for o = 1:num+1
            if o == 11
               monthave(i,t,1,o) =
sum(sum(Min(:,e:m)))./(month(t)*num);
               monthave(i,t,2,o) =
sum(sum(Max(:,e:m)))./(month(t)*num);
               monthave(i,t,3,o) =
sum(sum(Temp(:,e:m)))./(month(t)*num);
            else
               monthave(i,t,1,o) = sum(Min(o,e:m))./month(t);
               monthave(i,t,2,o) = sum(Max(o,e:m))./month(t);
               monthave(i,t,3,o) = sum(Temp(o,e:m))./month(t);
            end
        end
    end
    for q = w:sum(year(1:i,2))
        for n = 1:num
            if Max(n,q)>apy(i,n)
               vpy(i,n) = vpy(i,n)+1;
               apy(i,n) = Max(n,q);
               recvpy(i,n,vpy(i,n)) = i;
            end
            if Min(n,q)<bpy(i,n)
               kpy(i,n) = kpy(i,n)+1;
               bpy(i,n) = Min(n,q);
               reckpy(i,n,kpy(i,n)) = i;
            end
            ratios(i,n) = vpy(i,n)./kpy(i,n);
```

```
        end
        averageratios(i) = sum(ratios(i,:))/num;
    end
    y = y+1;
end



%% 5 periods of 10y each
varmis = zeros(num,5);
kallis = zeros(num,5);
averageis = zeros(num,5);
for j = 1:num
    for per = 1:5
        varmis(j,per) = sum(ave(j,(1+(per-
1)*10):(10*per),1))/10;
        kallis(j,per) = sum(ave(j,(1+(per-
1)*10):(10*per),2))/10;
        averageis(j,per) = sum(ave(j,(1+(per-
1)*10):(10*per),3))/10;
    end
end

referens = zeros(num,1);
referens = varmis(:,1);
varmis(:,1) = varmis(:,1)-referens;
varmis(:,2) = varmis(:,2)-referens;
varmis(:,3) = varmis(:,3)-referens;
varmis(:,4) = varmis(:,4)-referens;
varmis(:,5) = varmis(:,5)-referens;
referens = zeros(num,1);
referens = kallis(:,1);
kallis(:,1) = kallis(:,1)-referens;
kallis(:,2) = kallis(:,2)-referens;
kallis(:,3) = kallis(:,3)-referens;
kallis(:,4) = kallis(:,4)-referens;
kallis(:,5) = kallis(:,5)-referens;
referens = zeros(num,1);
referens = averageis(:,1);
averageis(:,1) = averageis(:,1)-referens;
averageis(:,2) = averageis(:,2)-referens;
averageis(:,3) = averageis(:,3)-referens;
averageis(:,4) = averageis(:,4)-referens;
averageis(:,5) = averageis(:,5)-referens;
%% Investigating the different seasons and how they have
changed
%monthave(year,month,min-max-ave,station(11th is all
averaged))
wintermax = zeros(num,50);
summermax = zeros(num,50);
```

```
autummax = zeros(num,50);
springmax = zeros(num,50);
wintermin = zeros(num,50);
summermin = zeros(num,50);
autummin = zeros(num,50);
springmin = zeros(num,50);
for j = 1:num
    ye = 1;
        for i = 1:50
            w1 = monthave(i,1,2,j);%./monthave(i,1,3,j)
            w2 = monthave(i,2,2,j);%./monthave(i,2,3,j);
            w3 = monthave(i,12,2,j);%./monthave(i,12,3,j);

            wintermax(j,i) = (w1+w2+w3)/3;
%winter(station,period,year in that period)

            w1 = monthave(i,1,1,j);
            w2 = monthave(i,2,1,j);
            w3 = monthave(i,12,1,j);

            wintermin(j,i) = (w1+w2+w3)/3;

            s1 = monthave(i,6,2,j);%./monthave(i,6,3,j);
            s2 = monthave(i,7,2,j);%./monthave(i,7,3,j);
            s3 = monthave(i,8,2,j);%./monthave(i,8,3,j);

            summermax(j,i) = (s1+s2+s3)/3;
%summer(station,period,year in that period)

            s1 = monthave(i,6,1,j);
            s2 = monthave(i,7,1,j);
            s3 = monthave(i,8,1,j);

            summermin(j,i) = (s1+s2+s3)/3;

            au1 = monthave(i,9,2,j);
            au2 = monthave(i,10,2,j);
            au3 = monthave(i,11,2,j);

            autummax(j,i) = (au1+au2+au3)/3;

            au1 = monthave(i,9,1,j);
            au2 = monthave(i,10,1,j);
            au3 = monthave(i,11,1,j);

            autummin(j,i) = (au1+au2+au3)/3;

            sp1 = monthave(i,3,2,j);
            sp2 = monthave(i,4,2,j);
            sp3 = monthave(i,5,2,j);
```

```
            springmax(j,i) = (sp1+sp2+sp3)/3;

            sp1 = monthave(i,3,1,j);
            sp2 = monthave(i,4,1,j);
            sp3 = monthave(i,5,1,j);

            springmin(j,i) = (sp1+sp2+sp3)/3;

            ye = ye+1;
        end
end

%% Least squares fit
%fitting the average to the function f = p1x+p2
fit = zeros(50,3,num);
p1 = zeros(3,num);
p2 = zeros(3,num);
unc = zeros(2,3,num);       %unc(p1-p2,max-min-ave,station)
for r = 1:num
    for u = 1:3
        l = zeros(50,1);
        l(:) = ave(r,:,u);
        P = [0 0];
        D = zeros(2);
        B = zeros(2,1);
        D(1,1) = sum(year(:,1).^2);
        D(1,2) = sum(year(:,1));
        D(2,1) = sum(year(:,1));
        D(2,2) = length(year(:,1));
        C = D^-1;
        B(1) = sum(year(:,1).*l(:));
        B(2) = sum(ave(r,:,u));
        H = C*B;
        p1(u,r) = H(1);
        p2(u,r) = H(2);
        fit(:,u,r) = p1(u,r).*year(:,1)+p2(u,r);
        unc(1,u,r) = C(1,1);
        unc(2,u,r) = C(2,2);
    end
end
%station,year,max-min-ave

%% Doing the same thing but for each day
days = linspace(1,length(Max(1,:)),length(Max(1,:)));
fitten = zeros(length(days),3,num);
p1 = zeros(3,num);
p2 = zeros(3,num);
Mean = zeros(3,num);
SE_p1 = zeros(3,num);
SSR = zeros(3,num);
tscore = zeros(3,num);
```

```
for r = 1:num
        P = [0 0];
        D = zeros(2);
        B = zeros(2,1);
        D(1,1) = sum(days.^2);
        D(1,2) = sum(days);
        D(2,1) = sum(days);
        D(2,2) = length(days);
        C = D^-1;
        B(1) = sum(days.*Max(r,:));
        B(2) = sum(Max(r,:));
        H = C*B;
        p1(1,r) = H(1);
        p2(1,r) = H(2);
        fitten(:,1,r) = p1(1,r).*days+p2(1,r);
        B = zeros(2,1);
        B(1) = sum(days.*Min(r,:));
        B(2) = sum(Min(r,:));
        H = C*B;
        p1(2,r) = H(1);
        p2(2,r) = H(2);
        fitten(:,2,r) = p1(2,r).*days+p2(2,r);
        B = zeros(2,1);
        B(1) = sum(days.*Temp(r,:));
        B(2) = sum(Temp(r,:));
        H = C*B;
        p1(3,r) = H(1);
        p2(3,r) = H(2);
        fitten(:,3,r) = p1(3,r).*days+p2(3,r);
        Mean(1,r) = sum(Max(r,:))/length(Max(1,:));
        Mean(2,r) = sum(Min(r,:))/length(Max(1,:));
        Mean(3,r) = sum(Temp(r,:))/length(Max(1,:));
        SE_p1(1,r) = (sum((transpose(Max(r,:))-
fitten(:,1,r)).^2))/(sqrt((sum((days-
(sum(days)/length(days))).^2))*(length(days)-2)));
        SE_p1(2,r) = (sum((transpose(Min(r,:))-
fitten(:,2,r)).^2))/(sqrt((sum((days-
(sum(days)/length(days))).^2))*(length(days)-2)));
        SE_p1(3,r) = (sum((transpose(Temp(r,:))-
fitten(:,3,r)).^2))/(sqrt((sum((days-
(sum(days)/length(days))).^2))*(length(days)-2)));
        SSR(1,r) = sum((transpose(Max(r,:))-
fitten(:,1,r)).^2);
        SSR(2,r) = sum((transpose(Min(r,:))-
fitten(:,2,r)).^2);
        SSR(3,r) = sum((transpose(Temp(r,:))-
fitten(:,3,r)).^2);
        tscore(1,r) = (p1(1,r)*sqrt(length(days)-
2))/sqrt(SSR(1,r)/sum((days-(sum(days)/length(days))).^2));
        tscore(2,r) = (p1(2,r)*sqrt(length(days)-
2))/sqrt(SSR(2,r)/sum((days-(sum(days)/length(days))).^2));
```

```
        tscore(3,r) = (p1(3,r)*sqrt(length(days)-
2))/sqrt(SSR(3,r)/sum((days-(sum(days)/length(days))).^2));
end


figure(1) %Max(station,:) fitten(:,1-max.2-min.3-temp,station)
plot(days,Max(5,:),'r+',days,fitten(:,2,5),'b-')
title('The t-distribution for cold extremes in Karlshamn')
xlabel('Day')
ylabel('Temperature {^oC}')
figure(2)                                                    %du
har # of data points degrees of freedom (length(Max(1,:))-2
plot(days,Min(1,:),'r+',days,fitten(:,2,1),'b-')
title('The minimum temperature of Bollerup')
xlabel('Day')
ylabel('Temperature {^oC}')
figure(3)
plot(days,Temp(1,:),'r+',days,fitten(:,3,1),'b-')
title('The average temperature of Bollerup')
xlabel('Day')
ylabel('Temperature {^oC}')
%% Plotting all the shit

% figure(1)
%
plot(year(:,1),ave(1,:,1),'r+',year(:,1),ave(1,:,2),'b+',year(
:,1),ave(1,:,3),'g+',year(:,1),fit(:,1,1),'r-
',year(:,1),fit(:,2,1),'b-',year(:,1),fit(:,3,1),'g-')
% title('The average temperature of Bollerup')
% legend('Average maximum temperature','Average minimum
temperature','Average temperature')
% xlabel('Year')
% ylabel('Temperature {^oC}')
%
% figure(2)
%
plot(year(:,1),ave(2,:,1),'r+',year(:,1),ave(2,:,2),'b+',year(
:,1),ave(2,:,3),'g+',year(:,1),fit(:,1,2),'r-
',year(:,1),fit(:,2,2),'b-',year(:,1),fit(:,3,2),'g-')
% title('The average temperature of Bredåkra')
% legend('Average maximum temperature','Average minimum
temperature','Average temperature')
% xlabel('Year')
% ylabel('Temperature {^oC}')
%
% figure(3)
%
plot(year(:,1),ave(3,:,1),'r+',year(:,1),ave(3,:,2),'b+',year(
:,1),ave(3,:,3),'g+',year(:,1),fit(:,1,3),'r-
',year(:,1),fit(:,2,3),'b-',year(:,1),fit(:,3,3),'g-')
% title('The average temperature of Falsterbo')
```

```
% legend('Average maximum temperature','Average minimum
temperature','Average temperature')
% xlabel('Year')
% ylabel('Temperature {^oC}')
%
% figure(4)
%
plot(year(:,1),ave(4,:,1),'r+',year(:,1),ave(4,:,2),'b+',year(
:,1),ave(4,:,3),'g+',year(:,1),fit(:,1,4),'r-
',year(:,1),fit(:,2,4),'b-',year(:,1),fit(:,3,4),'g-')
% title('The average temperature of Härnösand')
% legend('Average maximum temperature','Average minimum
temperature','Average temperature')
% xlabel('Year')
% ylabel('Temperature {^oC}')
%
% figure(5)
%
plot(year(:,1),ave(5,:,1),'r+',year(:,1),ave(5,:,2),'b+',year(
:,1),ave(5,:,3),'g+',year(:,1),fit(:,1,5),'r-
',year(:,1),fit(:,2,5),'b-',year(:,1),fit(:,3,5),'g-')
% title('The average temperature of Karlshamn')
% legend('Average maximum temperature','Average minimum
temperature','Average temperature')
% xlabel('Year')
% ylabel('Temperature (degrees)')
%
% figure(6)
%
plot(year(:,1),ave(6,:,1),'r+',year(:,1),ave(6,:,2),'b+',year(
:,1),ave(6,:,3),'g+',year(:,1),fit(:,1,6),'r-
',year(:,1),fit(:,2,6),'b-',year(:,1),fit(:,3,6),'g-')
% title('The average temperature of Laxbäcken')
% legend('Average maximum temperature','Average minimum
temperature','Average temperature')
% xlabel('Year')
% ylabel('Temperature {^oC}')
%
% figure(7)
%
plot(year(:,1),ave(7,:,1),'r+',year(:,1),ave(7,:,2),'b+',year(
:,1),ave(7,:,3),'g+',year(:,1),fit(:,1,7),'r-
',year(:,1),fit(:,2,7),'b-',year(:,1),fit(:,3,7),'g-')
% title('The average temperature of Luleå flygplats')
% legend('Average maximum temperature','Average minimum
temperature','Average temperature')
% xlabel('Year')
% ylabel('Temperature {^oC}')
%
% figure(8)
```

```
%
plot(year(:,1),ave(8,:,1),'r+',year(:,1),ave(8,:,2),'b+',year(
:,1),ave(8,:,3),'g+',year(:,1),fit(:,1,8),'r-
',year(:,1),fit(:,2,8),'b-',year(:,1),fit(:,3,8),'g-')
% title('The average temperature of Oxelösund')
% legend('Average maximum temperature','Average minimum
temperature','Average temperature')
% xlabel('Year')
% ylabel('Temperature {^oC}')
%
% figure(9)
%
plot(year(:,1),ave(9,:,1),'r+',year(:,1),ave(9,:,2),'b+',year(
:,1),ave(9,:,3),'g+',year(:,1),fit(:,1,9),'r-
',year(:,1),fit(:,2,9),'b-',year(:,1),fit(:,3,9),'g-')
% title('The average temperature of Såtenäs')
% legend('Average maximum temperature','Average minimum
temperature','Average temperature')
% xlabel('Year')
% ylabel('Temperature {^oC}')
%
% figure(10)
%
plot(year(:,1),ave(10,:,1),'r+',year(:,1),ave(10,:,2),'b+',yea
r(:,1),ave(10,:,3),'g+',year(:,1),fit(:,1,10),'r-
',year(:,1),fit(:,2,10),'b-',year(:,1),fit(:,3,10),'g-')
% title('The average temperature of Sundsvalls flygplats')
% legend('Average maximum temperature','Average minimum
temperature','Average temperature')
% xlabel('Year')
% ylabel('Temperature {^oC}')

% figure(1)
%
plot(year(:,1),wintermax(7,:),'b+',year(:,1),summermax(7,:),'r
+',year(:,1),wintermin(7,:),'b*',year(:,1),summermin(7,:),'r*'
)
% figure(2)
%
plot(year(:,1),autummax(7,:),'bl+',year(:,1),springmax(7,:),'g
+',year(:,1),autummin(7,:),'bl*',year(:,1),springmin(7,:),'g*'
)

% disp('Average temperature in 10y periods with the first 10y
period subtracted')
% disp(averageis)
% disp('Coldest temperature in 10y periods with the first 10y
period subtracted')
% disp(kallis)
% disp('Warmest temperature in 10y periods with the first 10y
period subtracted')
```

```
% disp(varmis)

% figure(3)
% plot(year(:,1),ratios(:,1),'b+')
% title('Ratio of warm and cold records')
% xlabel('Year')
% ylabel('Varm records/cold records')
```

Appendix B

One Sided	75%	80%	85%	90%	95%	97.5%	99%	99.5%	99.75%	99.9%	99.95%
Two Sided	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.8%	99.9%
1	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	127.3	318.3	636.6
2	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	14.09	22.33	31.60
3	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	7.453	10.21	12.92
4	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	5.598	7.173	8.610
5	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	4.773	5.893	6.869
6	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	4.317	5.208	5.959
7	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.029	4.785	5.408
8	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	3.833	4.501	5.041
9	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	3.690	4.297	4.781
10	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	3.581	4.144	4.587
11	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	3.497	4.025	4.437
12	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.428	3.930	4.318

13	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.372	3.852	4.221
14	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.326	3.787	4.140
15	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.286	3.733	4.073
16	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.252	3.686	4.015
17	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.222	3.646	3.965
18	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.197	3.610	3.922
19	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.174	3.579	3.883
20	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.153	3.552	3.850
21	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.135	3.527	3.819
22	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.119	3.505	3.792
23	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.104	3.485	3.767
24	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.091	3.467	3.745
25	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.078	3.450	3.725
26	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.067	3.435	3.707
27	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.057	3.421	3.690

28	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.047	3.408	3.674
29	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.038	3.396	3.659
30	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.030	3.385	3.646
40	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	2.971	3.307	3.551
50	0.679	0.849	1.047	1.299	1.676	2.009	2.403	2.678	2.937	3.261	3.496
60	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	2.915	3.232	3.460
80	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	2.887	3.195	3.416
100	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	2.871	3.174	3.390
120	0.677	0.845	1.041	1.289	1.658	1.980	2.358	2.617	2.860	3.160	3.373
∞	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	2.807	3.090	3.291