%Data Set

Path = 'The storage path of the file';

Number of Blood Pressure measurements = xlsread([Path,'\Source Data'],1,'C3:C74');

Number of Blood Pressure measurements Male = xlsread([Path,'\Source Data'],1,'D3:D74');

Number of Blood Pressure measurements Female= xlsread([Path,'\Source Data'],1,'E3:E74');

Number of individuals with hypertension = xlsread([Path,'\Source Data'],1,'F3:F74');

Number of individuals with hypertension Male= xlsread([Path,'\Source Data'],1,'G3:G74');

Number of individuals with hypertension Female= xlsread([Path,'\Source Data'],1,'H3:H74');

SBP = xlsread([Path,'\Source Data'],1,'I3:I74');

SBP\_Male = xlsread([Path,'\Source Data'],1,'J3:J74');

SBP\_Female = xlsread([Path,'\Source Data'],1,'K3:K74');

DBP = xlsread([Path,'\Source Data'],1,'L3:L74');

DBP\_Male = xlsread([Path,'\Source Data'],1,'M3:M74');

DBP\_Female = xlsread([Path,'\Source Data'],1,'N3:N74');

SBP\_Qingdao = xlsread([Path,'\Source Data'],1,'O3:O74');

SBP\_Male\_Qingdao = xlsread([Path,'\Source Data'],1,'P3:P74');

SBP\_Female\_Qingdao = xlsread([Path,'\Source Data'],1,'Q3:Q74');

DBP\_Qingdao = xlsread([Path,'\Source Data'],1,'R3:R74');

DBP\_Male\_Qingdao = xlsread([Path,'\Source Data'],1,'S3:S74');

DBP\_Female\_Qingdao = xlsread([Path,'\Source Data'],1,'T3:T74');

SBP\_Weihai = xlsread([Path,'\Source Data'],1,'U3:U74');

SBP\_Male\_Weihai = xlsread([Path,'\Source Data'],1,'V3:V74');

SBP\_Female\_Weihai = xlsread([Path,'\Source Data'],1,'W3:W74');

DBP\_Weihai = xlsread([Path,'\Source Data'],1,'X3:X74');

DBP\_Male\_Weihai = xlsread([Path,'\Source Data'],1,'Y3:Y74');

DBP\_Female\_Weihai = xlsread([Path,'\Source Data'],1,'Z3:Z74');

Ap = xlsread([Path,'\Source Data'],1,'AA3:AA74');

Air Temp\_Qingdao = xlsread([Path,'\Source Data'],1,'AB3:AB74');

Air Temp\_Weihai = xlsread([Path,'\Source Data'],1,'AC3:AC74');

PM25\_Qingdao = xlsread([Path,'\Source Data'],1,'AD3:AD74');

PM25\_Weihai = xlsread([Path,'\Source Data'],1,'AE3:AE74');

Weekly Ap = xlsread([Path,'\Source Data'],2,'B3:B74');

Weekly SBP = xlsread([Path,'\Source Data'],2,'C3:C74');

Weekly DBP = xlsread([Path,'\Source Data'],2,'D3:D74');

Ap\_std\_max2fold = xlsread([Path,'\Source Data'],3,'B35:M35');

Ap\_std\_min2fold = xlsread([Path,'\Source Data'],3,'B36:M36');

SBP\_std\_max2fold = xlsread([Path,'\Source Data'],3,'B11:M11');

SBP\_std\_min2fold = xlsread([Path,'\Source Data'],3,'B12:M12');

DBP\_std\_max2fold = xlsread([Path,'\Source Data'],3,'B23:M23');

DBP\_std\_min2fold = xlsread([Path,'\Source Data'],3,'B24:M24');

t = 1:1:72;

%%Figure 1

subplot(3,1,1)

title('Group All','FontSize',18)

semilogy(t,Number of Blood Pressure measurements,'k-',t,Number of individuals with hypertension,'k--','LineWidth',1.5)

xticks([1 6 12 18 24 30 36 42 48 54 60 66 72]); xlim([0 73]);

ylim([350 17500]);

xticklabels([]);

subplot(3,1,2)

title('Group Male','FontSize',18)

semilogy(t,Number of Blood Pressure measurements Male,'b-',t,Number of individuals with hypertension Male,'b--','LineWidth',1.5)

ylabel('Number of blood pressure physical examinations (solid line) and hypertension (dashed line)','FontSize',11)

xticks([1 6 12 18 24 30 36 42 48 54 60 66 72]); xlim([0 73]);

ylim([200 10500]);

xticklabels([]);

subplot(3,1,3)

title('Group Female','FontSize',18)

semilogy(t,Number of Blood Pressure measurements Female,'r-',t,Number of individuals with hypertension Female,'r--','LineWidth',1.5)

xticks([1 6 12 18 24 30 36 42 48 54 60 66 72]);

xlim([0 73]); ylim([110 11000]);

xticklabels({' ','6','12','6','12','6','12','6','12','6','12','6','12'})

text(1,399-349,'Year','HorizontalAlignment','center','FontSize',10,'LineWidth',1.2)

text(6,260-210,'2015','HorizontalAlignment','center','FontSize',12)

text(18,296-246,'2016','HorizontalAlignment','center','FontSize',12)

text(30,367-317,'2017','HorizontalAlignment','center','FontSize',12)

text(42,390-340,'2018','HorizontalAlignment','center','FontSize',12)

text(54,485-435,'2019','HorizontalAlignment','center','FontSize',12)

text(66,561-511,'2020','HorizontalAlignment','center','FontSize',12)

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%Figure 2

subplot(3,2,1)

plot(t,Ap(1:12),'--',t,Ap(13:24),'--',t,Ap(25:36),'--',t,Ap(37:48),'--',t,Ap(49:60),'--',t,Ap(61:72),'--','LineWidth',0.8)

hold on

plot(t,Ap\_value,'k','LineWidth',2)

Y\_up3 = Ap\_std\_max2fold;

Y\_down3 = Ap\_std\_min2fold;

hold on

patch([Y fliplr(Y)],[Y\_down3 fliplr(Y\_up3)],'k','facecolor',[.8 .8 .8],'EdgeColor','white')

h1 = legend('2015','2016','2017','2018','2019','2020','average value')

set(h1,'Orientation','horizon')

set(h1,'Box','off')

xticklabels([]);

ylabel('Ap index/nT')

subplot(3,2,3)

plot(t,SBP(1:12),'--',t,SBP(13:24),'--',t,SBP(25:36),'--',t,SBP(37:48),'--',t,SBP(49:60),'--',t,SBP(61:72),'--','LineWidth',0.8)

hold on

plot(t,SBP\_value,'k','LineWidth',2)

xlim([1,12])

Y\_up1=SBP\_std\_max2fold;

Y\_down1=SBP\_std\_min2fold;

hold on

patch([Y fliplr(Y)],[Y\_down1 fliplr(Y\_up1)],'k','facecolor',[.8 .8 .8],'EdgeColor','white')

ylabel('Systolic BP/mmHg')

xticklabels([]);

subplot(3,2,5)

plot(t,DBP(1:12),'--',t,DBP(13:24),'--',t,DBP(25:36),'--',t,DBP(37:48),'--',t,DBP(49:60),'--',t,DBP(61:72),'--','LineWidth',0.8)

hold on

plot(t,DBP\_value,'k','LineWidth',2)

xlim([1,12])

Y\_up2=DBP\_std\_max2fold;

Y\_down2=DBP\_std\_min2fold;

hold on

patch([Y fliplr(Y)],[Y\_down2 fliplr(Y\_up2)],'k','facecolor',[.8 .8 .8],'EdgeColor','white')

xlabel('Month')

ylabel('Diastolic BP/mmHg')

SBP\_value = (SBP(1:12)+SBP(13:24)+SBP(25:36)+SBP(37:48)+SBP(49:60)+SBP(61:72))/6

DBP\_value = (DBP(1:12)+DBP(13:24)+DBP(25:36)+DBP(37:48)+DBP(49:60)+DBP(61:72))/6

Ap\_value = (Ap\_0(1:12)+Ap\_0(13:24)+Ap\_0(25:36)+Ap\_0(37:48)+Ap\_0(49:60)+Ap\_0(61:72))/6

Ap\_move = smoothdata(Ap,'movmean',36)

Detrended Ap = Ap-Ap\_move

subplot(3,2,2)

plot(t,Ap,'g-',t,Detrended Ap,'g:','LineWidth',1.5)

ylabel('Ap index/nT','FontSize',11)

hl\_2 = legend('Ap','Detrended Ap')

set(hl\_2,'Orientation','horizon')

set(hl\_2,'Box','off')

xticks([1 6 12 18 24 30 36 42 48 54 60 66 72]); xlim([0 73]);

xticklabels([])

subplot(3,2,4)

plot(t,SBP,'k-',t,SBP\_Male,'b-',t,SBP\_Female,'r-','LineWidth',1.5)

ylabel('Systolic BP/mmHg','FontSize',11)

hl = legend('Group All','Group Male','Group Female')

set(hl,'Orientation','horizon')

set(hl,'Box','off')

xticks([1 6 12 18 24 30 36 42 48 54 60 66 72]); xlim([0 73]);

xticklabels([])

hold on

yyaxis right

bar(SBP\_Male-SBP\_Female)

ylim([0,100]); yticks([0 20]); yticklabels({'0','20'})

ylabel('Blue minus Red','FontSize',9)

ylabel('Blue minus Red','Rotation',-90)

subplot(3,2,6)

plot(t,DBP,'k:',t,DBP\_Male,'b:',t,DBP\_Female,'r:','LineWidth',1.5)

xlabel('Month','FontSize',11)

ylabel('Diastolic BP/mmHg','FontSize',11)

hl\_1 = legend('Group All','Group Male','Group Female')

set(hl\_1,'Orientation','horizon')

set(hl\_1,'Box','off')

xticks([1 6 12 18 24 30 36 42 48 54 60 66 72]); xlim([0 73]);

xticklabels({' ','6','12','6','12','6','12','6','12','6','12','6','12'})

text(1,75.16-9.2,'Year','HorizontalAlignment','center','FontSize',10,'LineWidth',1.2)

text(6,71.33-5.37,'2015','HorizontalAlignment','center','FontSize',11)

text(18,72.05-6.09,'2016','HorizontalAlignment','center','FontSize',11)

text(30,71.52-5.56,'2017','HorizontalAlignment','center','FontSize',11)

text(42,71.73-5.77,'2018','HorizontalAlignment','center','FontSize',11)

text(54,72.6-6.64,'2019','HorizontalAlignment','center','FontSize',11)

text(66,73.56-7.6,'2020','HorizontalAlignment','center','FontSize',11)

hold on

yyaxis right

bar(DBP\_Male-DBP\_Female)

ylim([0,100]); yticks([0 20]); yticklabels({'0','20'})

ylabel('Blue minus Red','Rotation',-90)

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%Calculate correlation coefficients and significance levels:

[rho, pval] = corr(Y, X, 'Type', 'Spearman');

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%Figure 3

Fs = 1; T = 1/Fs; N = 72; t1 = (0:N-1)\*T; %Sampling frequency and period

d1 = [t1;SBP']

d2 = [t1;SBP\_Male']

d3 = [t1;SBP\_Female']

d4 = [t1;DBP']

d5 = [t1;DBP\_Male']

d6 = [t1;DBP\_Female']

d7 = [t1;Ap]

d8 = [t1;Detrended Ap]

ys\_1 = SBP;

L\_1=length(ys\_1);

X\_1=fft(ys\_1)\*2/L\_1; %Fourier Transform of Signal

f\_1=Fs/2\*linspace(0,1,L\_1/2+1);

X2\_1=abs(X\_1(1:L\_1/2.+1)).^2;

X2\_1\_N = normalize(X2\_1,'range')

ys\_2 = SBP\_Male;

L\_2=length(ys\_2);

X\_2=fft(ys\_2)\*2/L\_2;

f\_2=Fs/2\*linspace(0,1,L\_2/2+1);

X2\_2=abs(X\_2(1:L\_2/2.+1)).^2;

X2\_2\_N = normalize(X2\_2,'range')

ys\_3 = SBP\_Female;

L\_3=length(ys\_3);

X\_3=fft(ys\_3)\*2/L\_3;

f\_3=Fs/2\*linspace(0,1,L\_3/2+1);

X2\_3=abs(X\_3(1:L\_3/2.+1)).^2;

X2\_3\_N = normalize(X2\_3,'range')

ys\_4 = DBP;

L\_4=length(ys\_4);

X\_4=fft(ys\_4)\*2/L\_4;

f\_4=Fs/2\*linspace(0,1,L\_4/2+1);

X2\_4=abs(X\_4(1:L\_4/2.+1)).^2;

X2\_4\_N = normalize(X2\_4,'range')

ys\_5 = DBP\_Male;

L\_5=length(ys\_5);

X\_5=fft(ys\_5)\*2/L\_5;

f\_5=Fs/2\*linspace(0,1,L\_5/2+1);

X2\_5=abs(X\_5(1:L\_5/2.+1)).^2;

X2\_5\_N = normalize(X2\_5,'range')

ys\_6 = avg\_low\_women;

L\_6=length(ys\_6);

X\_6=fft(ys\_6)\*2/L\_6;

f\_6=Fs/2\*linspace(0,1,L\_6/2+1);

X2\_6=abs(X\_6(1:L\_6/2.+1)).^2;

X2\_6\_N = normalize(X2\_6,'range')

ys\_7 = Ap;

L\_7=length(ys\_7);

X\_7=fft(ys\_7)\*2/L\_7;

f\_7=Fs/2\*linspace(0,1,L\_7/2+1);

X2\_7=abs(X\_7(1:L\_7/2.+1)).^2;

X2\_7\_N = normalize(X2\_7,'range')

ys\_8 = Detrended Ap;

L\_8=length(ys\_8);

X\_8=fft(ys\_8)\*2/L\_8;

f\_8=Fs/2\*linspace(0,1,L\_8/2+1);

X2\_8=abs(X\_8(1:L\_8/2.+1)).^2;

X2\_8\_N = normalize(X2\_8,'range')

%Fig. 3a-c

subplot(3,1,1)

plot(1./f\_7,X2\_7\_N,'g-',1./f\_8,15\*X2\_8\_N,'g:','LineWidth',1)

xlim([1 72])

legend('Ap','Detrended-Ap')

xticklabels([]);

ylabel('Amplitude','fontweight','bold','FontSize',10)

subplot(3,1,2)

plot(1./f\_1,X2\_1\_N,'k-',1./f\_2,X2\_2\_N,'b-',1./f\_3,X2\_3\_N,'r-',1./f\_4,X2\_4\_N,'k:',1./f\_5,X2\_5\_N,'b:',1./f\_6,X2\_6\_N,'r:','LineWidth',1)

legend('All Systolic BP','Male Systolic BP','Female Systolic BP','All Diastolic BP','Male Diastolic BP','Female Diastolic BP')

xlim([1 72])

ylabel('Amplitude','fontweight','bold','FontSize',10)

subplot(3,1,3)

plot(1./f\_1,X2\_1\_N,'k-',1./f\_2,X2\_2\_N,'b-',1./f\_3,X2\_3\_N,'r-',1./f\_4,X2\_4\_N,'k:',1./f\_5,X2\_5\_N,'b:',1./f\_6,X2\_6\_N,'r:','LineWidth',1)

ylim([0 7])

xlim([2 17])

ylabel('Amplitude','fontweight','bold','FontSize',10)

xlabel('Period (month)','fontweight','bold','FontSize',10)

%Fig. 3d-i

subplot(3,2,1)

xwt(d1,d8)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

set(gca,'FontSize',10); xticklabels([])

set(gca,'position',[0.06,0.67,0.35,0.23])

ylabel('Period (month)')

subplot(3,2,2)

xwt(d4,d8)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

set(gca,'FontSize',10); xticklabels([])

set(gca,'position',[0.56,0.67,0.35,0.23])

subplot(3,2,3)

xwt(d2,d8)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

set(gca,'FontSize',10); xticklabels([])

set(gca,'position',[0.06,0.38,0.35,0.23])

ylabel('Period (month)')

subplot(3,2,4)

xwt(d5,d8)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

set(gca,'FontSize',10); xticklabels([])

set(gca,'position',[0.56,0.38,0.35,0.23])

subplot(3,2,5)

xwt(d3,d8)

xticks([1 6 12 18 24 30 36 42 48 54 60 66 72]);

xticklabels({' ','6','12','6','12','6','12','6','12','6','12','6','12'})

text(-0.5,4.63+0.6,'Year','HorizontalAlignment','center','FontSize',10,'LineWidth',1.2)

text(6,2.132+3.098,'2015','HorizontalAlignment','center','FontSize',10)

text(18,3.717+1.513,'2016','HorizontalAlignment','center','FontSize',10)

text(30,4.454+0.776,'2017','HorizontalAlignment','center','FontSize',10)

text(42,4.405+0.825,'2018','HorizontalAlignment','center','FontSize',10)

text(54,3.634+1.596,'2019','HorizontalAlignment','center','FontSize',10)

text(66,1.869+3.361,'2020','HorizontalAlignment','center','FontSize',10)

set(gca,'position',[0.06,0.09,0.35,0.23])

ylabel('Period (month)')

subplot(3,2,6)

xwt(d6,d8)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

xticklabels({'6','12','6','12','6','12','6','12','6','12','6','12'})

text(6,2.132+3.098,'2015','HorizontalAlignment','center','FontSize',10)

text(18,3.717+1.513,'2016','HorizontalAlignment','center','FontSize',10)

text(30,4.454+0.776,'2017','HorizontalAlignment','center','FontSize',10)

text(42,4.405+0.825,'2018','HorizontalAlignment','center','FontSize',10)

text(54,3.634+1.596,'2019','HorizontalAlignment','center','FontSize',10)

text(66,1.869+3.361,'2020','HorizontalAlignment','center','FontSize',10)

set(gca,'position',[0.56,0.09,0.35,0.23])

ylabel('Period (month)')

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%Figure 4

ys\_1 = Air Temp\_Qingdao;

L\_1=length(ys\_1);

X\_1=fft(ys\_1)\*2/L\_1; %Fourier Transform of Signal

f\_1=Fs/2\*linspace(0,1,L\_1/2+1);

X2\_1=abs(X\_1(1:L\_1/2.+1)).^2;

X2\_1\_N = normalize(X2\_1,'range')

ys\_2 = Air Temp\_Weihai;

L\_2=length(ys\_2);

X\_2=fft(ys\_2)\*2/L\_2;

f\_2=Fs/2\*linspace(0,1,L\_2/2+1);

X2\_2=abs(X\_2(1:L\_2/2.+1)).^2;

X2\_2\_N = normalize(X2\_2,'range')

ys\_3 = PM25\_Qingdao;

L\_3=length(ys\_3);

X\_3=fft(ys\_3)\*2/L\_3;

f\_3=Fs/2\*linspace(0,1,L\_3/2+1);

X2\_3=abs(X\_3(1:L\_3/2.+1)).^2;

X2\_3\_N = normalize(X2\_3,'range')

ys\_4 = PM25\_Weihai;

L\_4=length(ys\_4);

X\_4=fft(ys\_4)\*2/L\_4;

f\_4=Fs/2\*linspace(0,1,L\_4/2+1);

X2\_4=abs(X\_4(1:L\_4/2.+1)).^2;

X2\_4\_N = normalize(X2\_4,'range')

%Fig. 4a-c

subplot(3,1,1)

plot(t,Air Temp\_Qingdao,'k--',t,Air Temp\_Weihai,'k:','LineWidth',1.0);

ylabel('Air Temperature/℃')

legend('Qingdao','Weihai','FontSize',10)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]); xticklabels([])

xlim([0 73]);

subplot(3,1,2)

plot(t,PM25\_Qingdao,'r--',t,PM\_Weihai,'r:','LineWidth',1.0);

ylabel('PM2.5 \mug/m³')

legend('Qingdao','Weihai','FontSize',10)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

xticklabels({'6','12','6','12','6','12','6','12','6','12','6','12'})

xlim([0 73]);

subplot(3,1,3)

plot(1./f\_1,100\*X2\_1\_N,'k--',1./f\_2,100\*X2\_2\_N,'k:',1./f\_3,100\*X2\_3\_N,'r--',1./f\_4,100\*X2\_4\_N,'r:','LineWidth',1.3)

legend('Qingdao Air Temp','Weihai Air Temp','Qingdao PM2.5','Weihai PM2.5','FontSize',10)

xlim([0 73])

xlabel('Period (month)','fontweight','bold','FontSize',10)

ylabel('Amplitude','fontweight','bold','FontSize',12)

%Fig. 4d-k

Fs = 1; T = 1/Fs; N = 72; t1 = (0:N-1)\*T; %Sampling frequency and period

d9 = [t1;Air Temp\_Qingdao']

d10 = [t1;Air Temp\_Weihai']

d11 = [t1;PM25\_Qingdao']

d12 = [t1;PM25\_Weihai']

subplot(4,2,1)

xwt(d9,d1)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

set(gca,'FontSize',10); xticklabels([])

ylabel('Period (month)')

subplot(4,2,2)

xwt(d9,d4)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

set(gca,'FontSize',10); xticklabels([])

ylabel('Period (month)')

subplot(4,2,3)

xwt(d11,d1)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

set(gca,'FontSize',10); xticklabels([])

ylabel('Period (month)')

subplot(4,2,4)

xwt(d11,d4)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

set(gca,'FontSize',10); xticklabels([])

ylabel('Period (month)')

subplot(4,2,5)

xwt(d10,d1)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

set(gca,'FontSize',10); xticklabels([])

ylabel('Period (month)')

subplot(4,2,6)

xwt(d10,d4)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

set(gca,'FontSize',10); xticklabels([])

ylabel('Period (month)')

subplot(4,2,7)

xwt(d12,d1)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

set(gca,'FontSize',10); xticklabels({'6','12','6','12','6','12','6','12','6','12','6','12'});

ylabel('Period (month)')

subplot(4,2,8)

xwt(d12,d4)

xticks([6 12 18 24 30 36 42 48 54 60 66 72]);

set(gca,'FontSize',10); xticklabels({'6','12','6','12','6','12','6','12','6','12','6','12'});

ylabel('Period (month)')