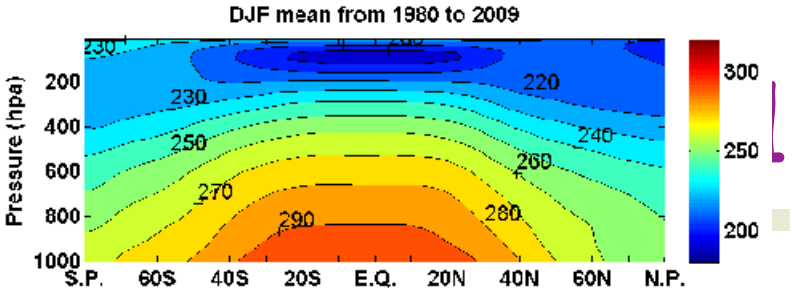
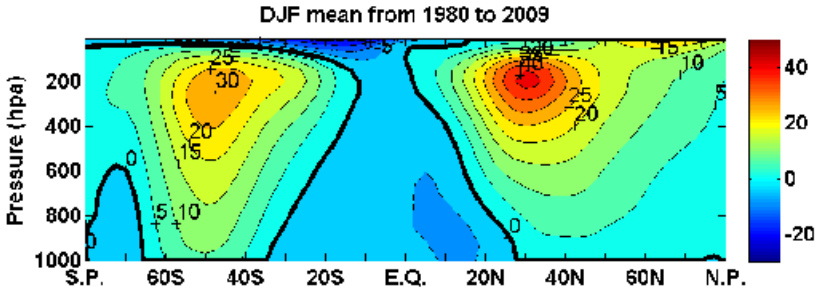
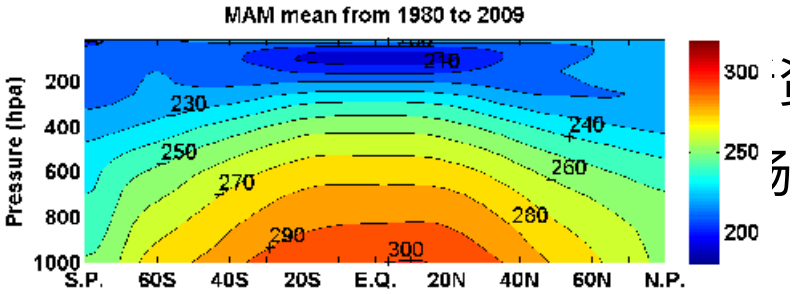
Assignments 1

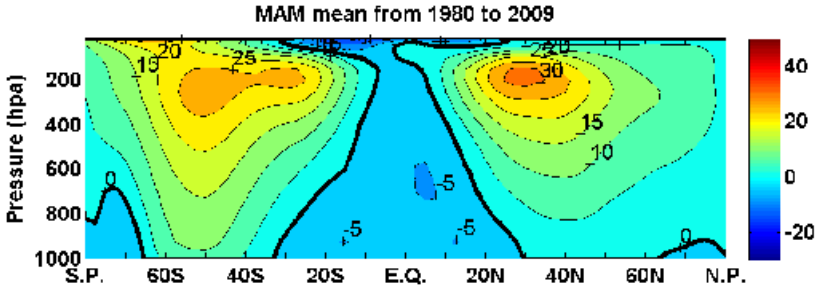
- 请使用多年（>20年）的月平均再分析资料（NCEP/NCAR)，画出各季节（至少冬夏两季）纬向平均温度场、纬向平均纬向风场的高度－纬度剖面分布，并简述其分布特征和季节变化特征。
- 请使用多年（>20年）的月平均再分析资料（NCEP/NCAR)，画出各季节（至少冬夏两季）温度场、纬向风场在各高度（850、500、100 hPa， 对于温度场请再画出1000hPa）上的分布，并简述其分布特征和季节变化特征。

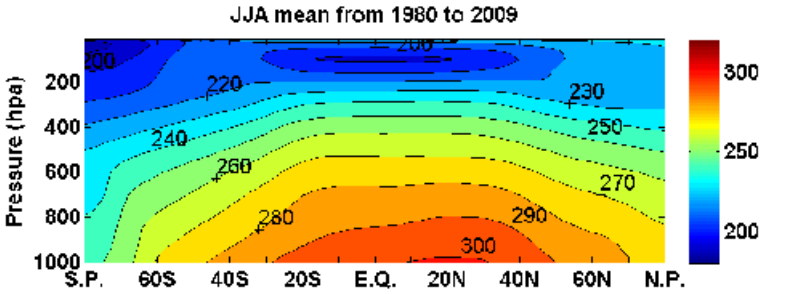
- 请使
季节
面分

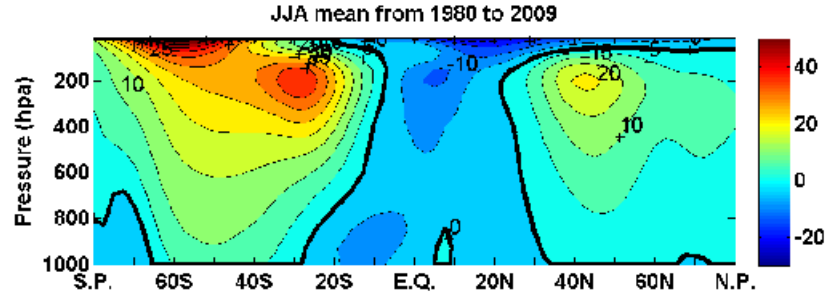

DJF mean from 1980 to 2009
Pressure (hpa)
S.P. 60S 40S 20S E.Q. 20N 40N 60N N.P.

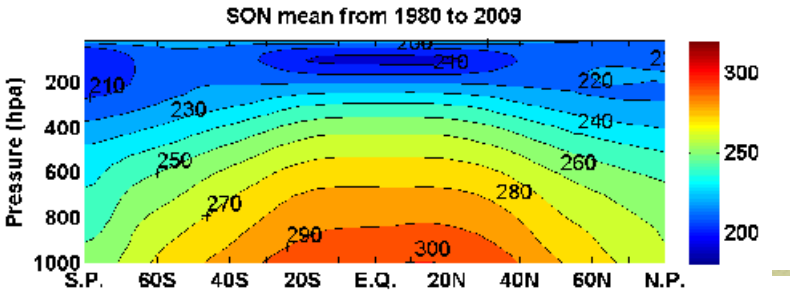

DJF mean from 1980 to 2009
Pressure (hpa)
S.P. 60S 40S 20S E.Q. 20N 40N 60N N.P.

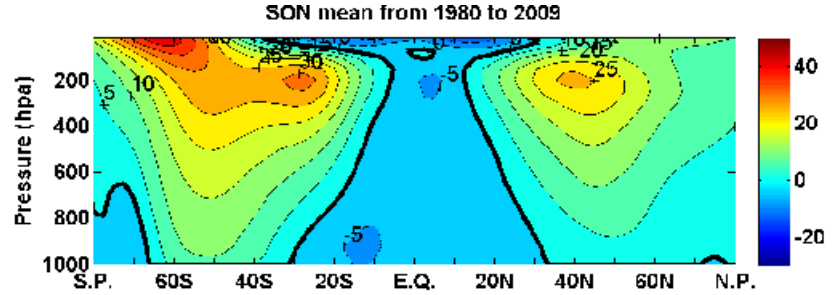

MAM mean from 1980 to 2009
Pressure (hpa)
S.P. 60S 40S 20S E.Q. 20N 40N 60N N.P.


MAM mean from 1980 to 2009
Pressure (hpa)
S.P. 60S 40S 20S E.Q. 20N 40N 60N N.P.


JJA mean from 1980 to 2009
Pressure (hpa)
S.P. 60S 40S 20S E.Q. 20N 40N 60N N.P.

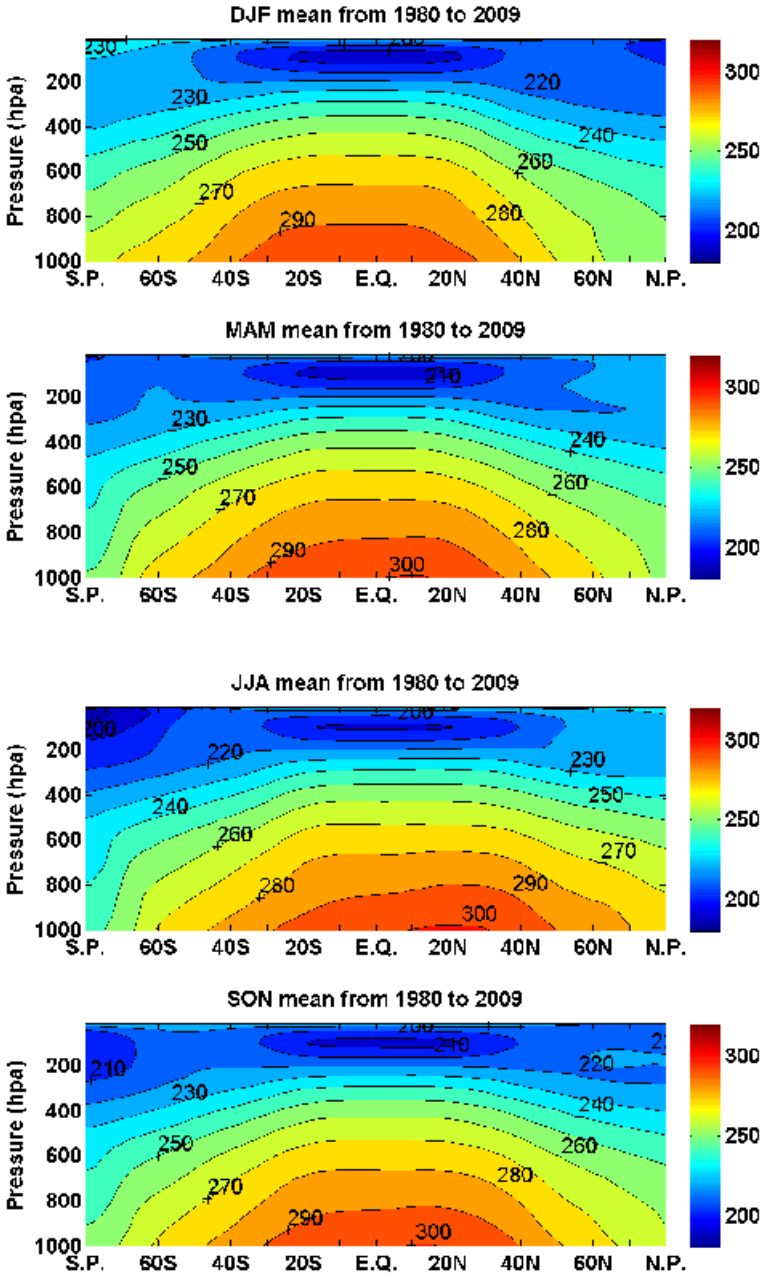

JJA mean from 1980 to 2009
Pressure (hpa)
S.P. 60S 40S 20S E.Q. 20N 40N 60N N.P.


SON mean from 1980 to 2009
Pressure (hpa)
S.P. 60S 40S 20S E.Q. 20N 40N 60N N.P.

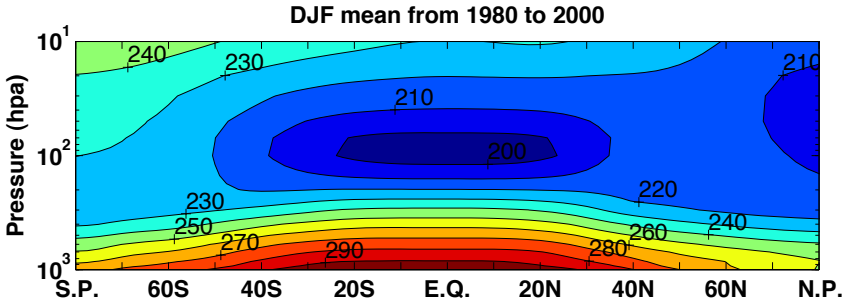

SON mean from 1980 to 2009
Pressure (hpa)
S.P. 60S 40S 20S E.Q. 20N 40N 60N N.P.

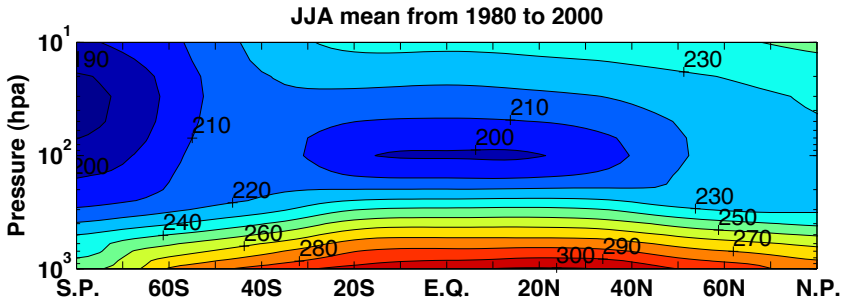
Question 1

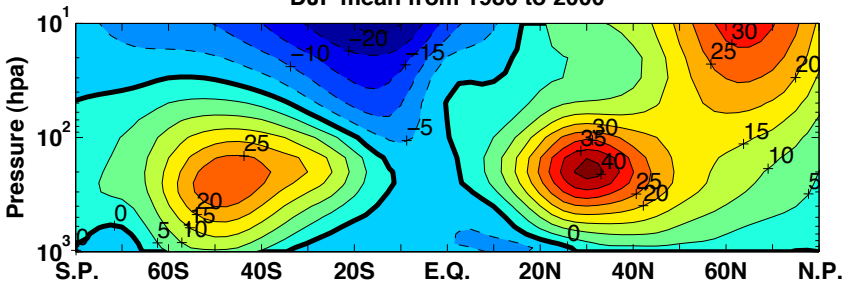
- **温度场:**
- 垂直结构
  - 对流层，平流层
  - 随纬度的变化
- 水平结构
  - 对流层，平流层
  - 随纬度，高度的变化
- 季节变化

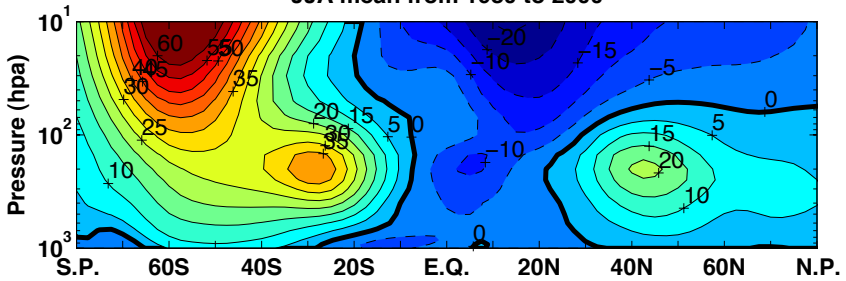


Question 1


DJF mean from 1980 to 2000
Pressure (hpa)
S.P.
60S
40S
20S
E.Q.
20N
40N
60N
N.P.

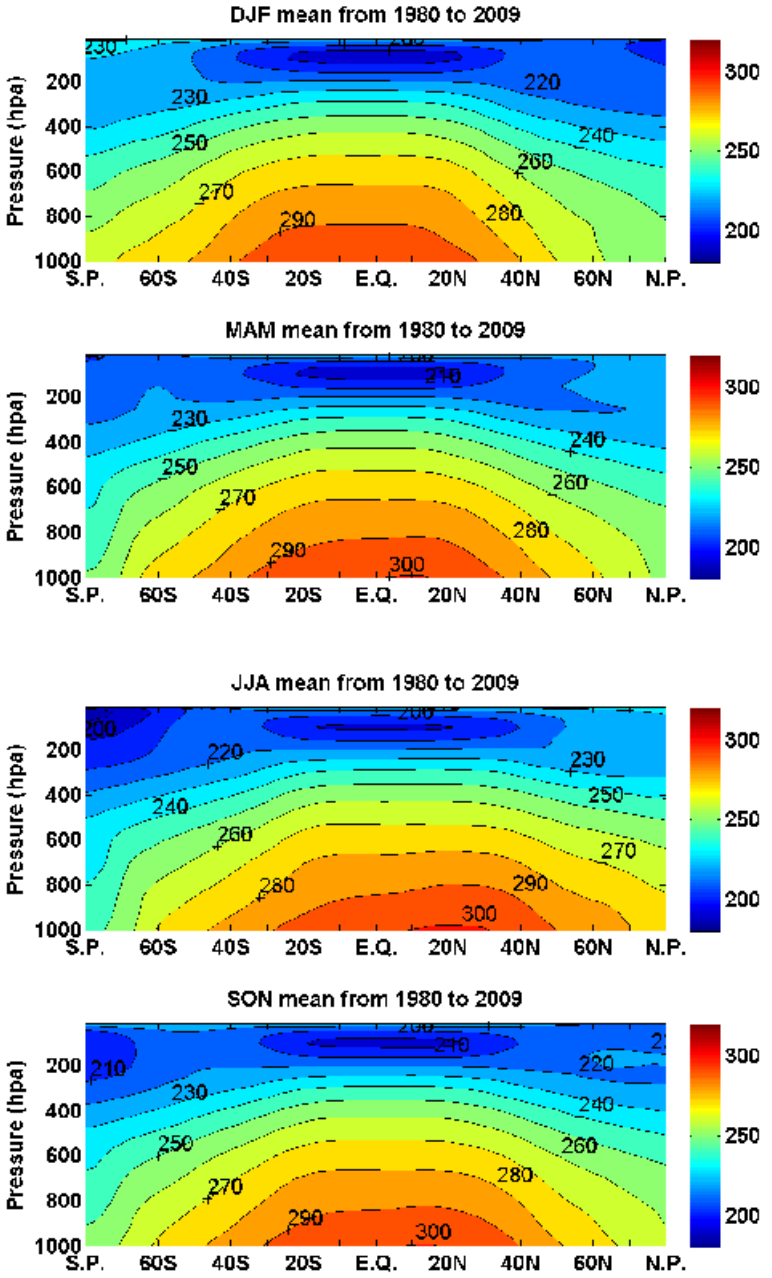

JJA mean from 1980 to 2000
Pressure (hpa)
S.P.
60S
40S
20S
E.Q.
20N
40N
60N
N.P.


DJF mean from 1980 to 2000
Pressure (hpa)
S.P.
60S
40S
20S
E.Q.
20N
40N
60N
N.P.


JJA mean from 1980 to 2000
Pressure (hpa)
S.P.
60S
40S
20S
E.Q.
20N
40N
60N
N.P.

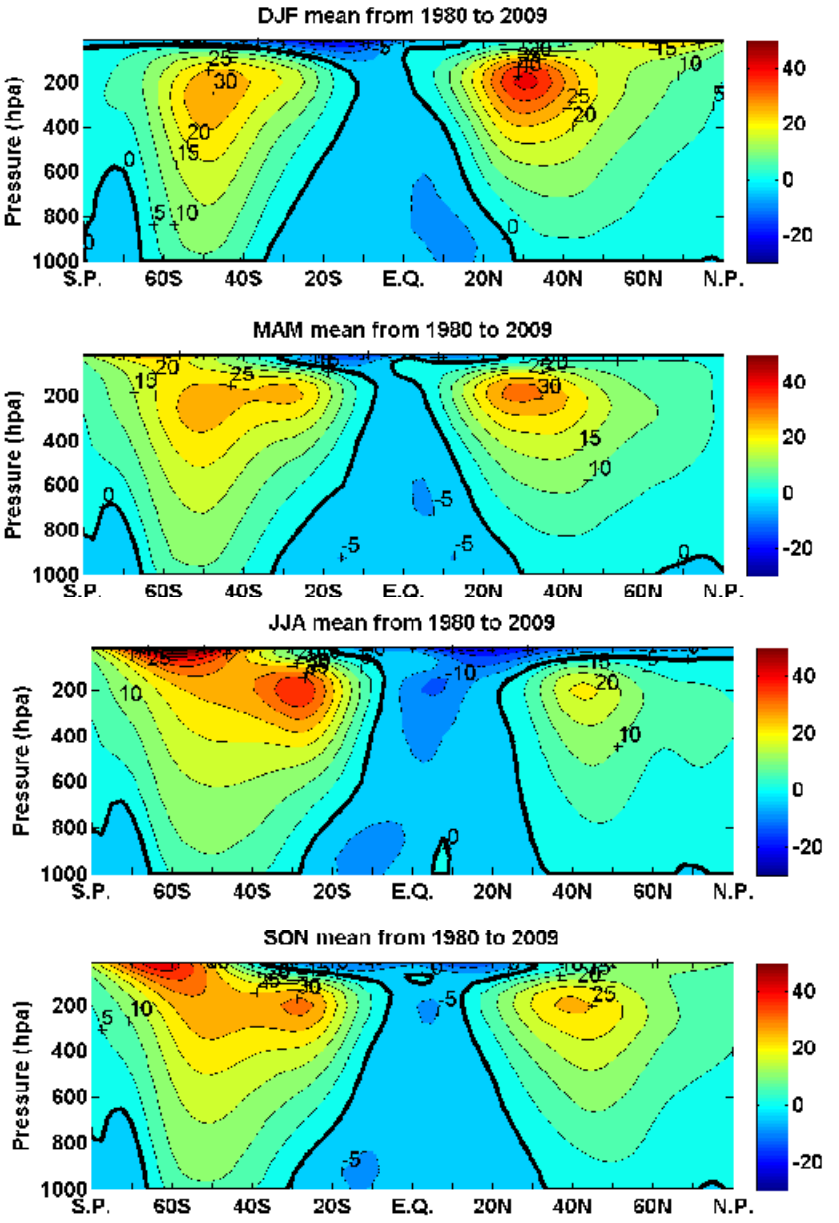
Question 1

- **温度场:**
- 垂直结构
  - 对流层，平流层
  - 随纬度的变化
- 水平结构
  - 对流层，平流层
  - 随纬度，高度的变化
- 季节变化

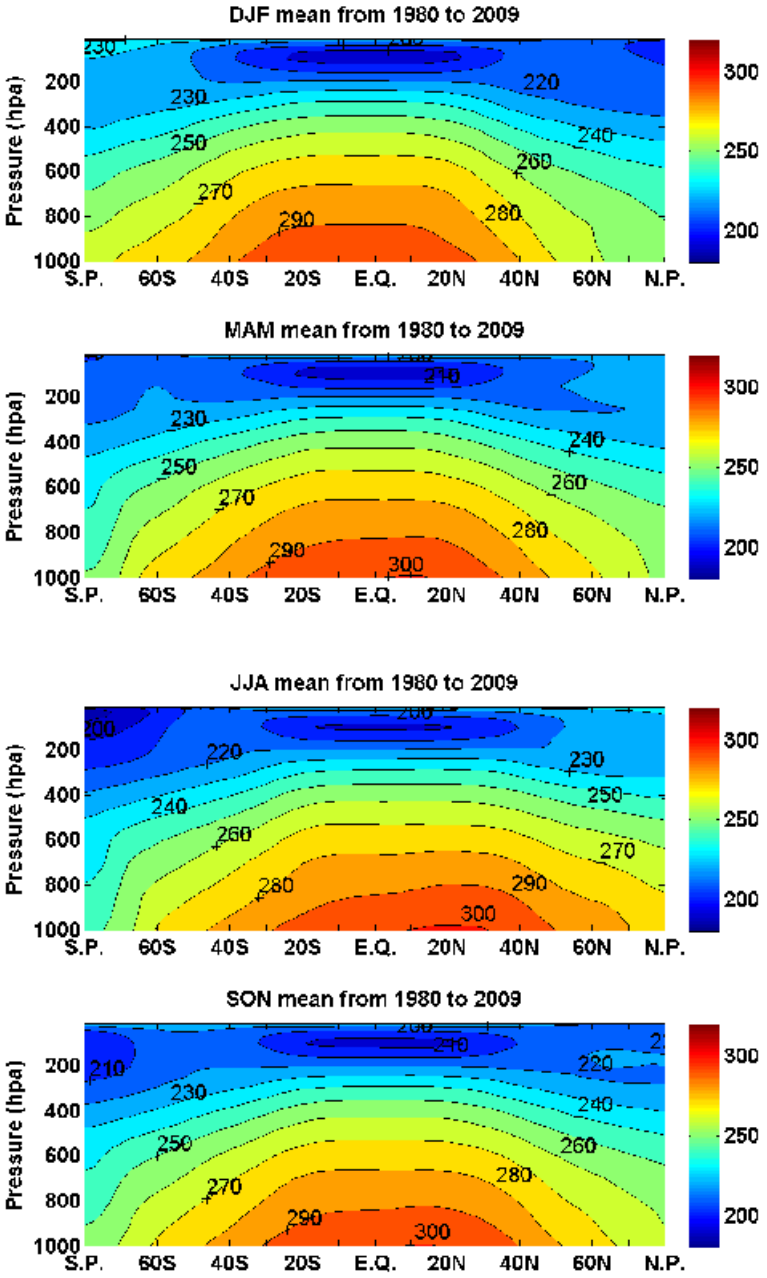


Question 1

- **风场：**
- 西风带，东风带
  - 对流层低层、高层，平流层
  - 随纬度的变化
- 水平，垂直结构
- 季节变化：位置，强度，副热带与温带急流
- 与温度场的匹配



- **风场:**
- 西风带
  - 对
  - 随
- 水平，
- 季节变
  急流
- 与温度



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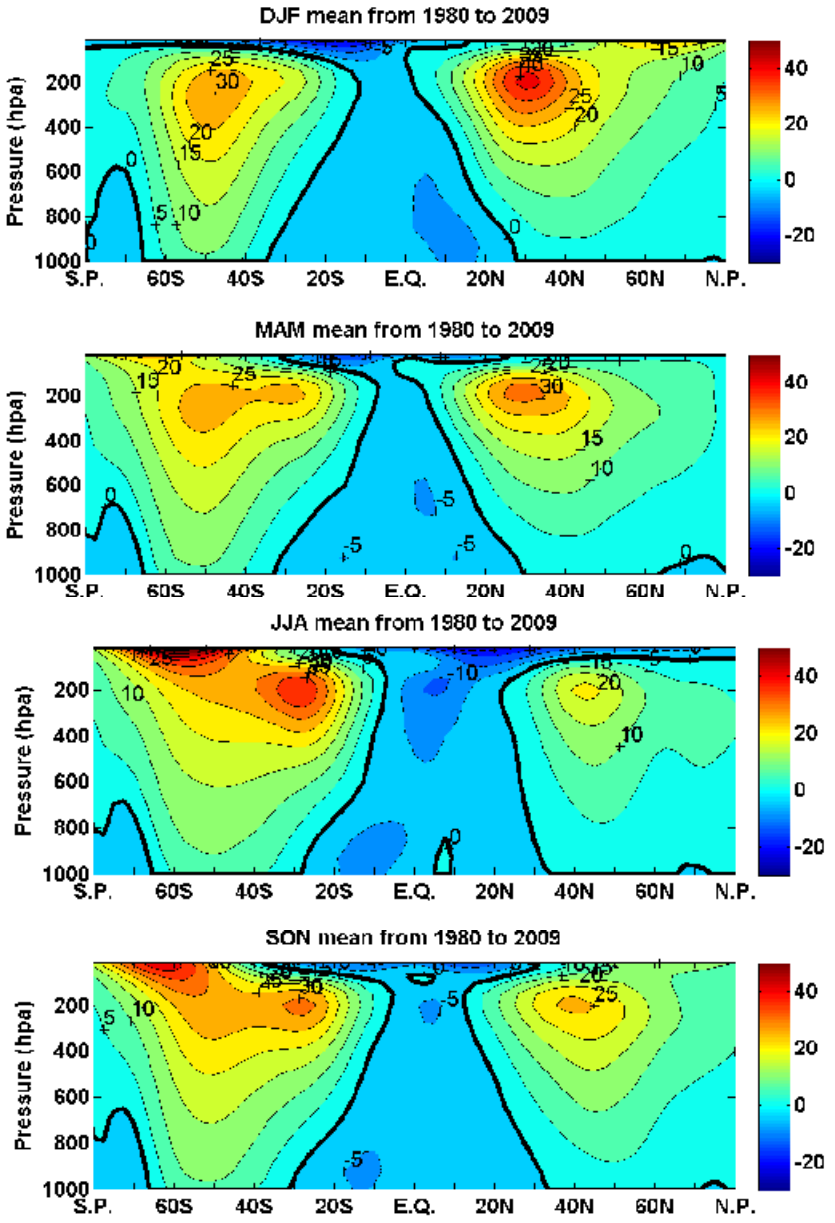
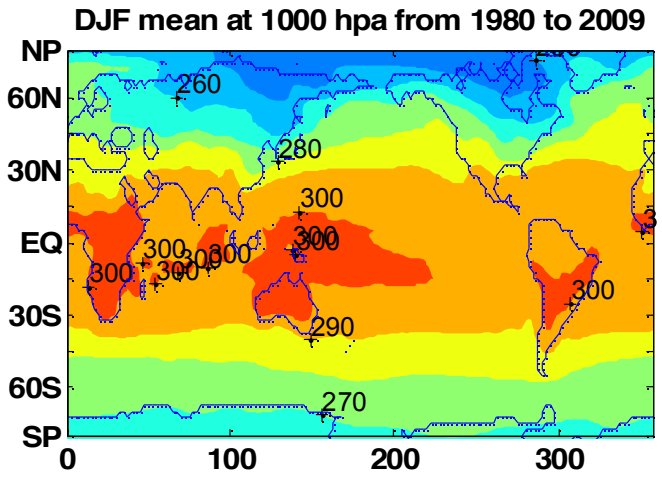


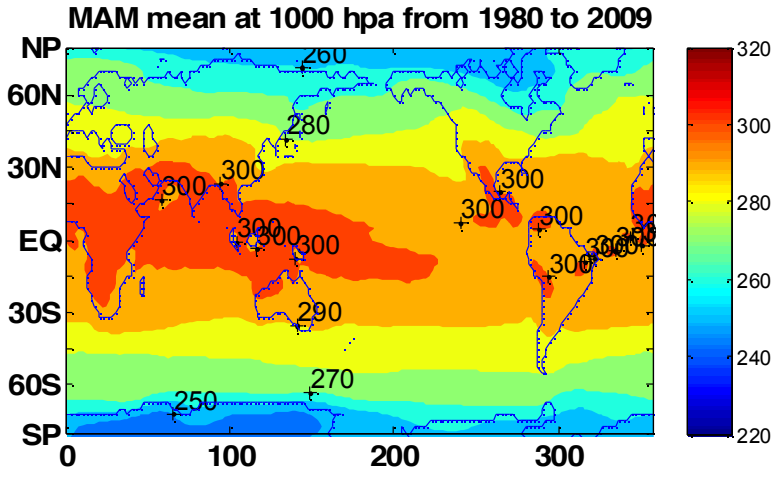
Question 2

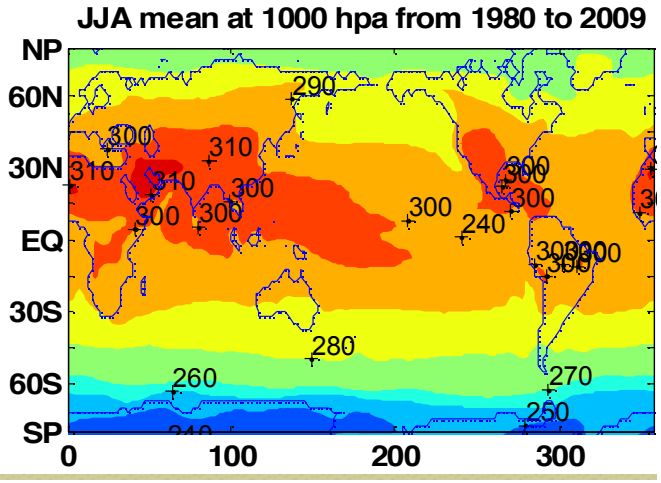
- 温度场－纬向差异:
  - 受海陆分布的影响
  - 垂直变化
  - 季节变化
- 请使用多年（>20年）的月平均再分析资料（NCEP/NCAR)画出各季节温度场，纬向风场在各高度（850、500、100 hPa， 对于温度场请再画出1000 hPa）上的分布，并简述其特征。

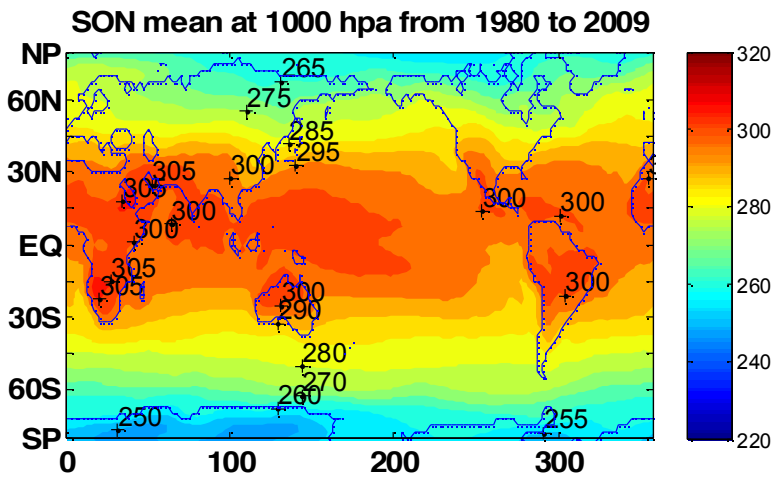
Question 2

- 温度场－纬向
  - 受海陆分布
  - 垂直变化
  - 季节变化



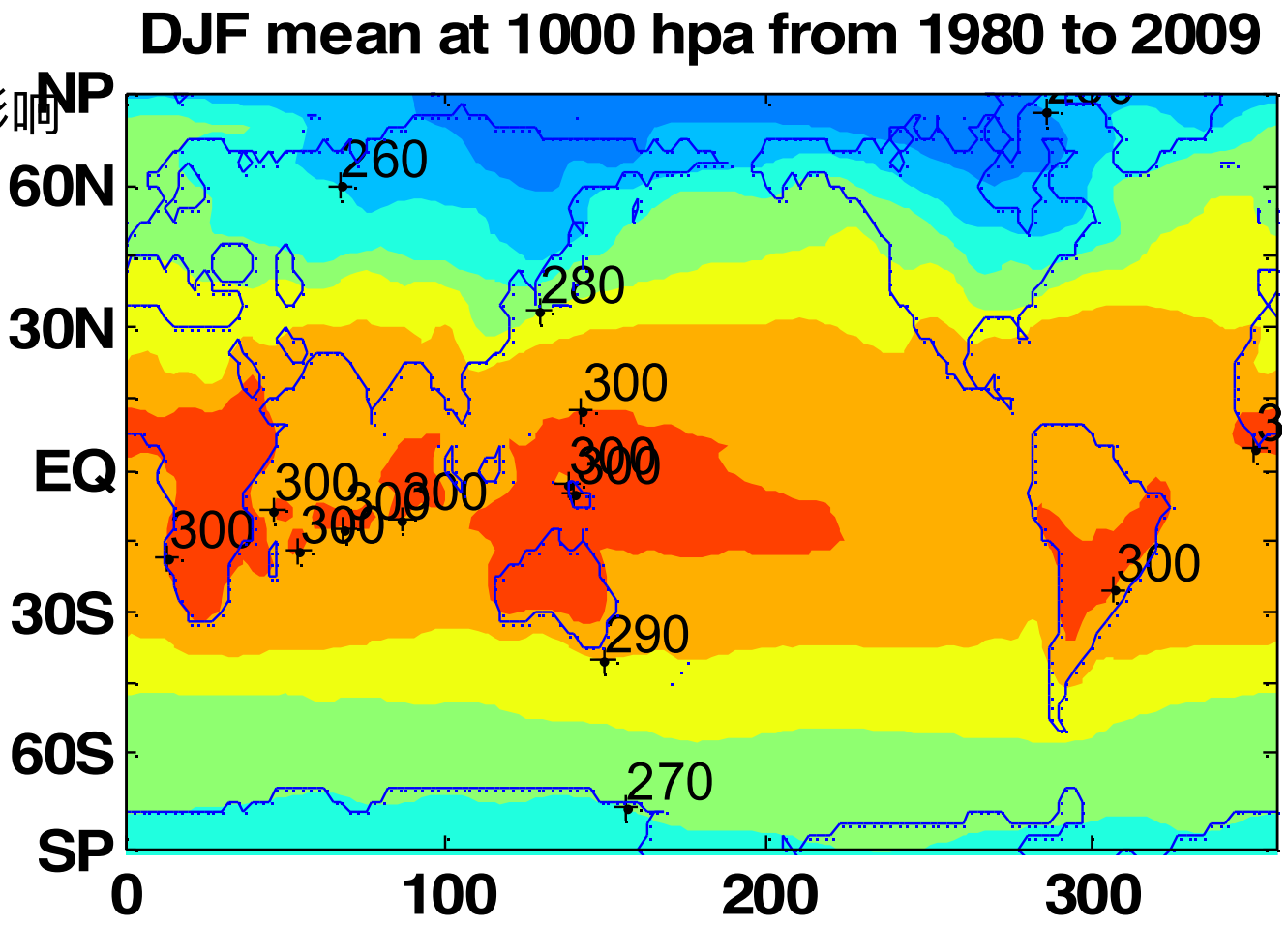




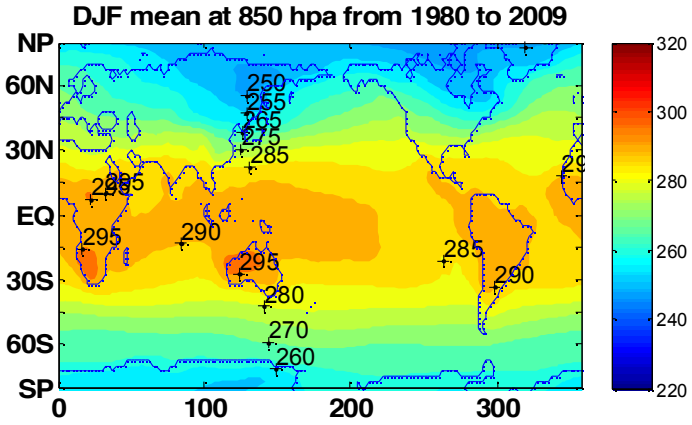


Question 2

- 温度场－纬向差异:
  - 受海陆分布的影响
  - 垂直变化
  - 季节变化



Question 2


DJF mean at 850 hpa from 1980 to 2009
NP
60N
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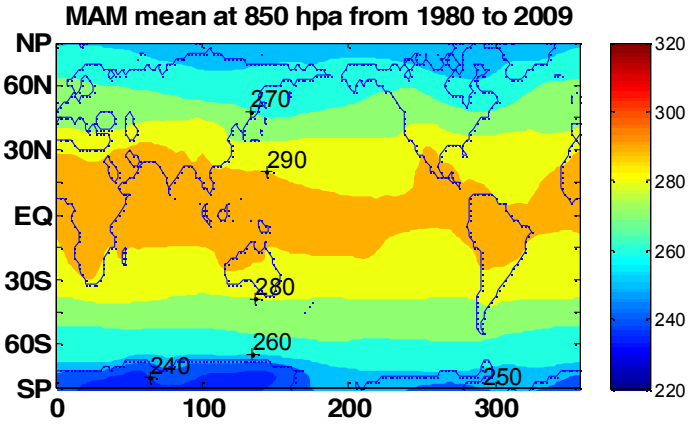
MAM mean at 850 hpa from 1980 to 2009
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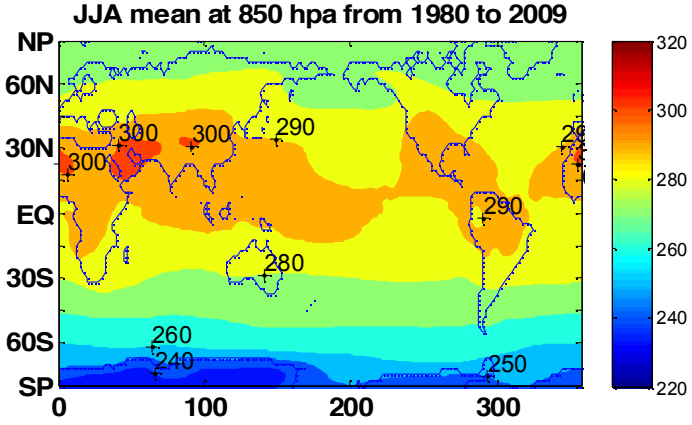
JJA mean at 850 hpa from 1980 to 2009
NP
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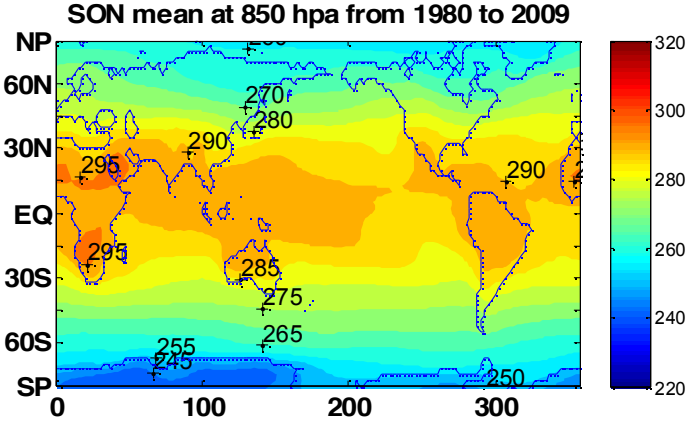
SON mean at 850 hpa from 1980 to 2009
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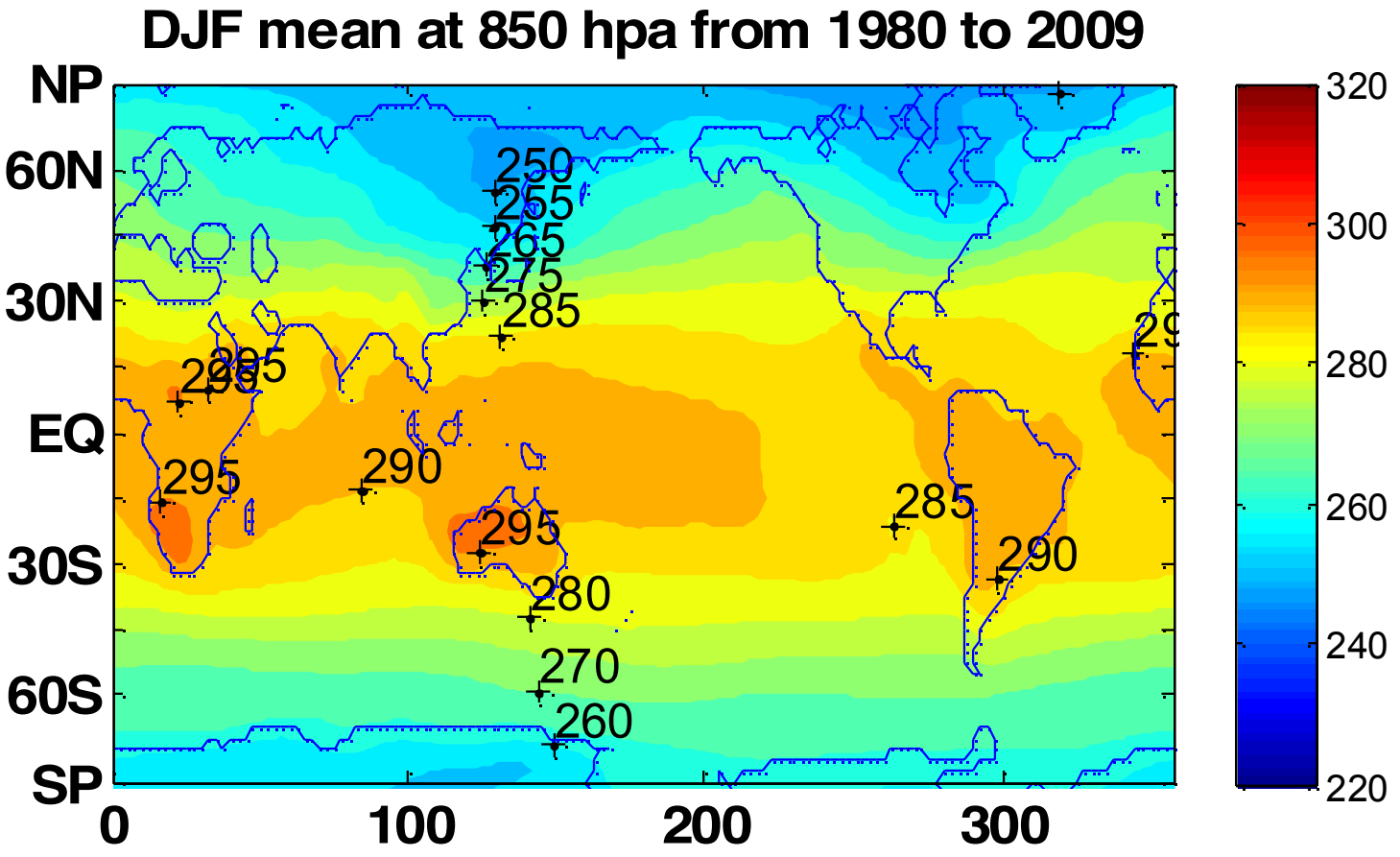
Question 2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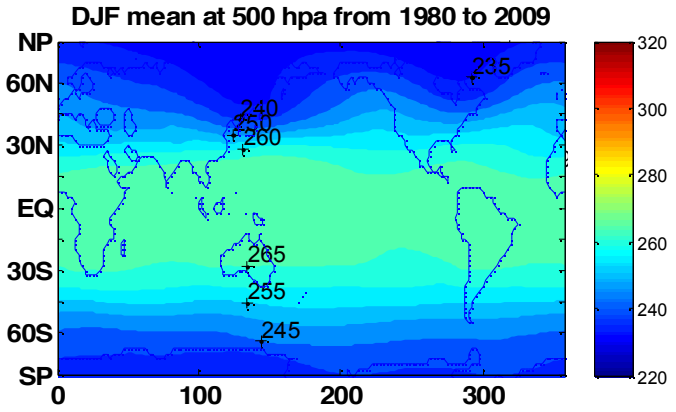
Question 2


DJF mean at 500 hpa from 1980 to 2009
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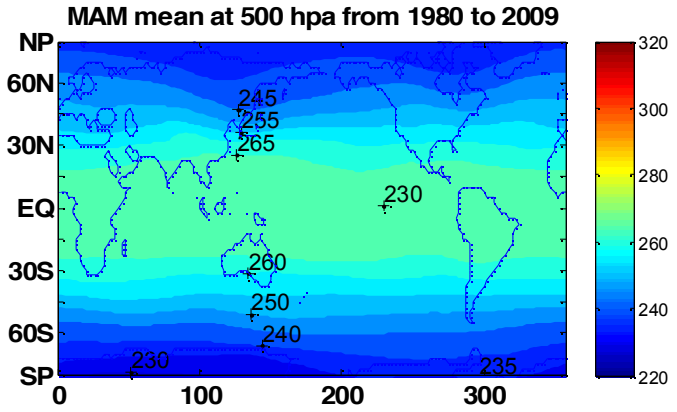
MAM mean at 500 hpa from 1980 to 2009
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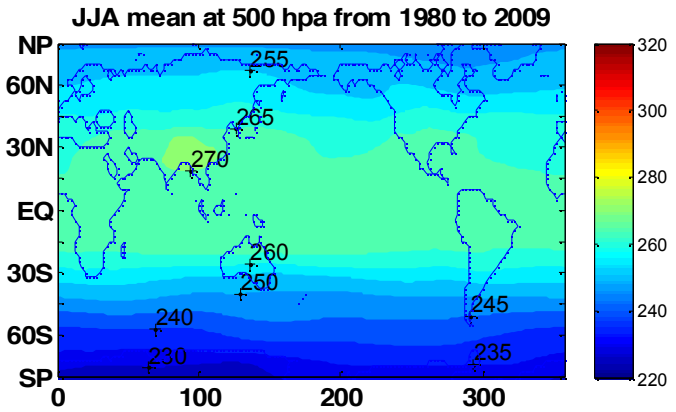
JJA mean at 500 hpa from 1980 to 2009
NP
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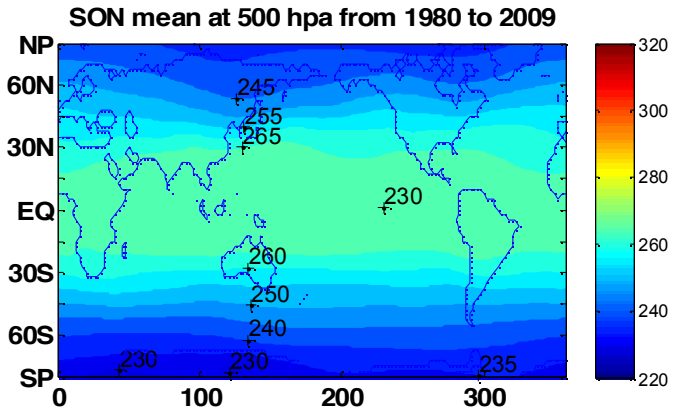
SON mean at 500 hpa from 1980 to 2009
NP
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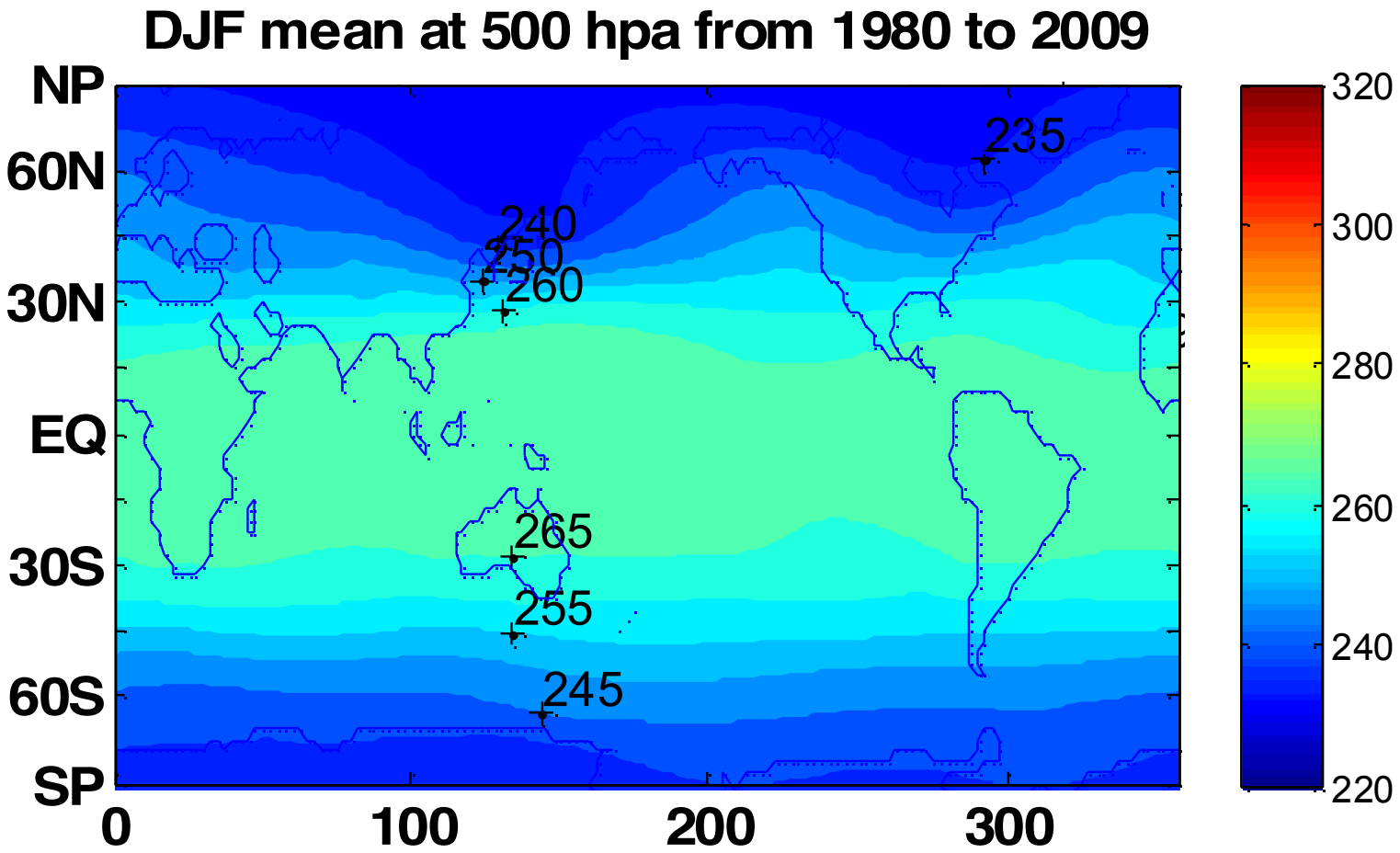
Question 2


DJF mean at 500 hpa from 1980 to 2009
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EQ
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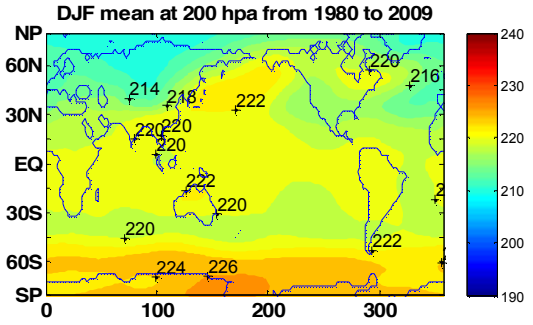
Question 2


DJF mean at 200 hpa from 1980 to 2009
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EQ
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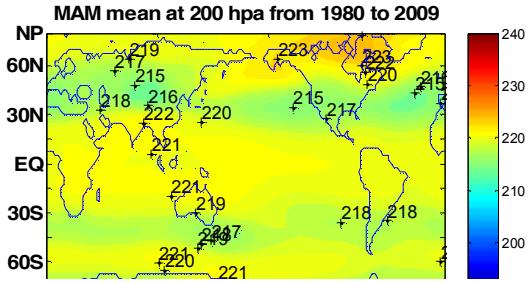
200
190


MAM mean at 200 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
240
230
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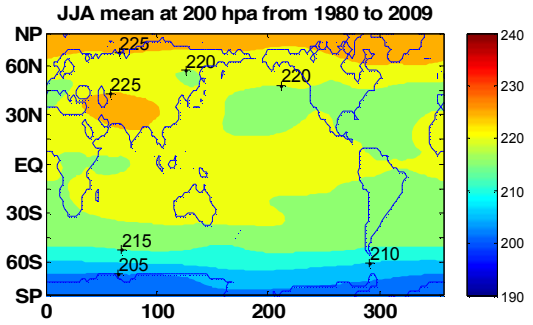
210
200


JJA mean at 200 hpa from 1980 to 2009
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EQ
30S
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SP
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200
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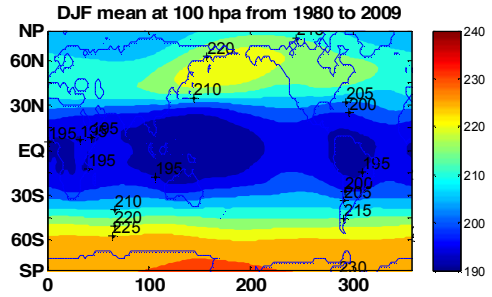
DJF mean at 100 hpa from 1980 to 2009
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EQ
30S
60S
SP
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240
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210
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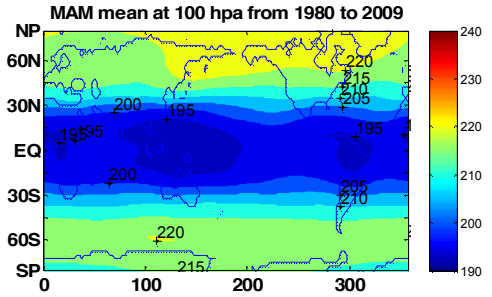
190


MAM mean at 100 hpa from 1980 to 2009
NP
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30N
EQ
30S
60S
SP
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200
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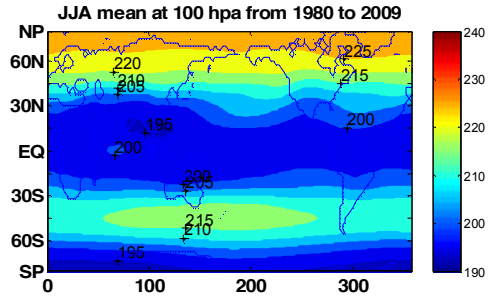
JJA mean at 100 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
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SP
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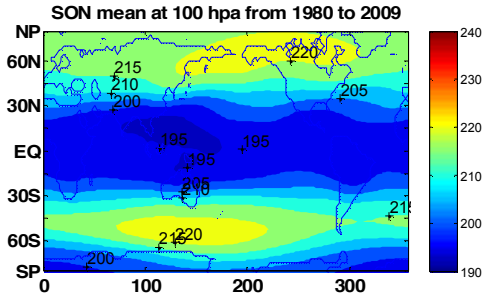
SON mean at 100 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
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SP
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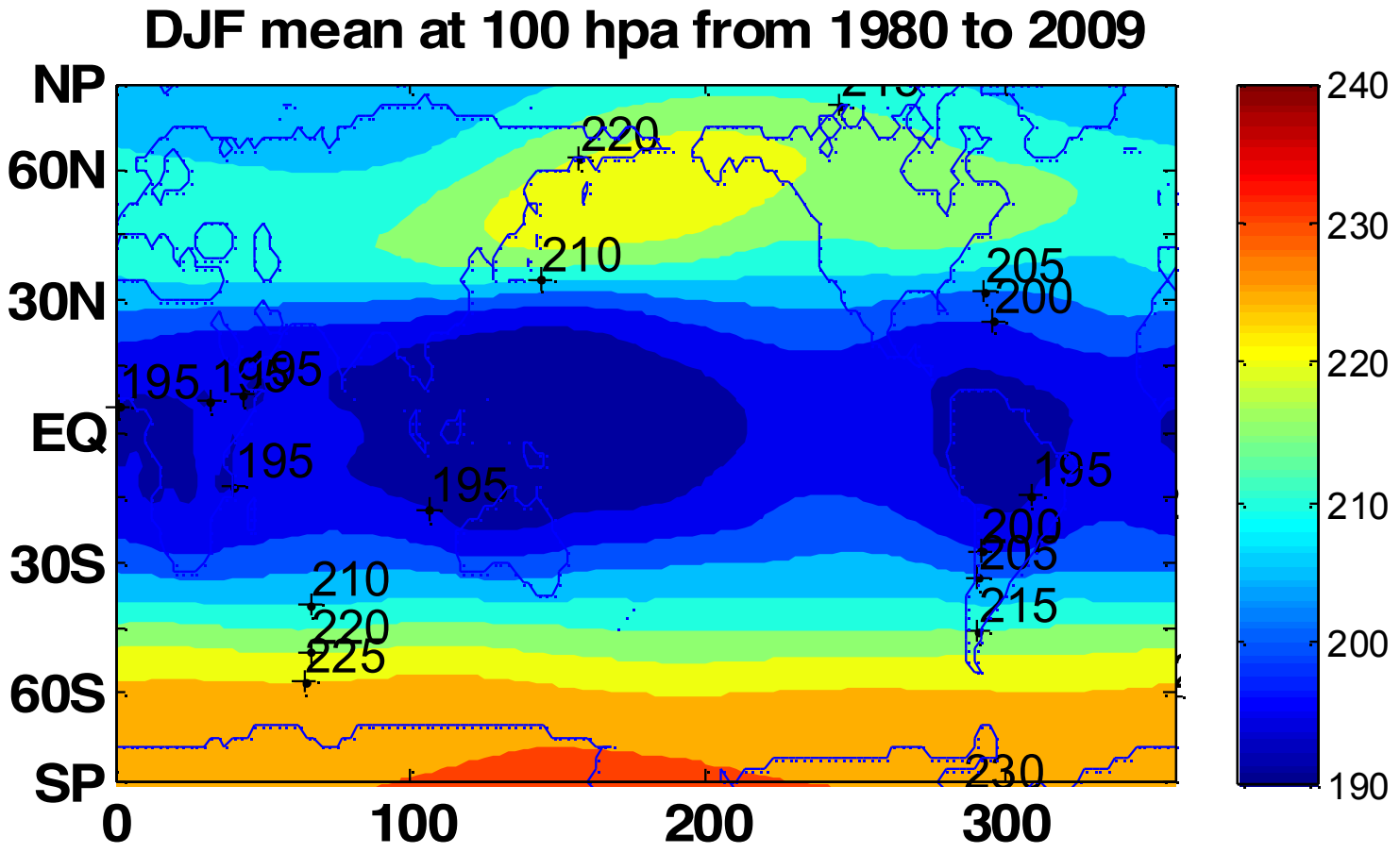
190

Question 2


DJF mean at 100 hpa from 1980 to 2009
NP
60N
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EQ
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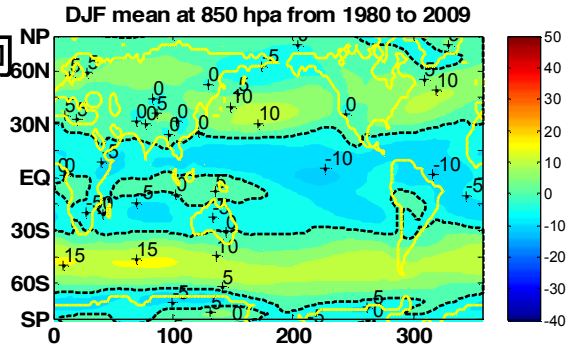
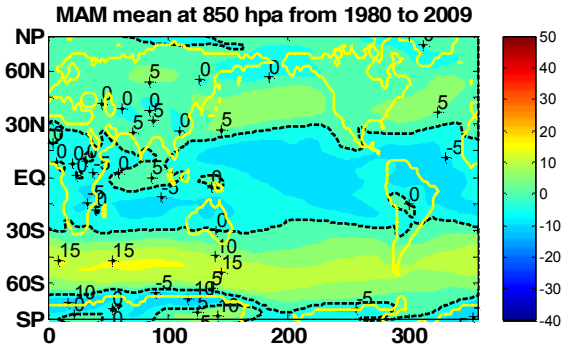
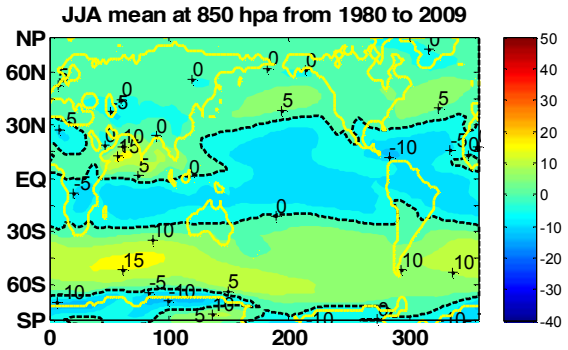
200
205
210
220
225
215
230
240
230
220
210
200
190

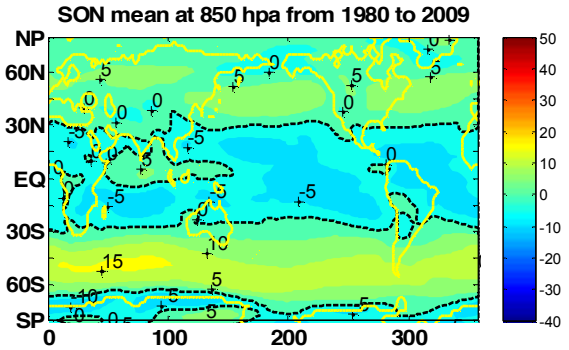
Question 2

- 风场－纬向差异:
  - 受海陆分布的影响
  - 垂直变化
  - 季节变化



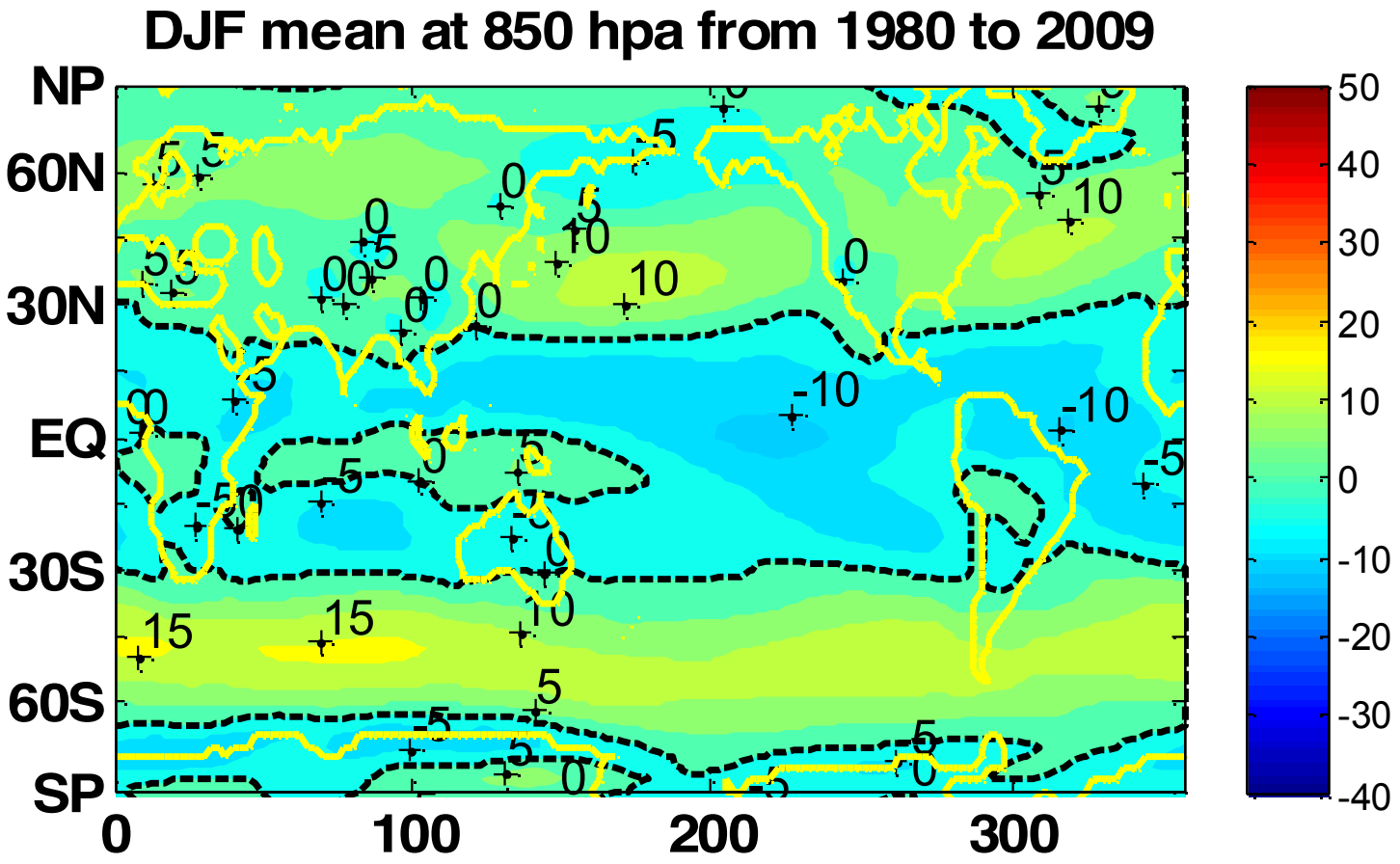




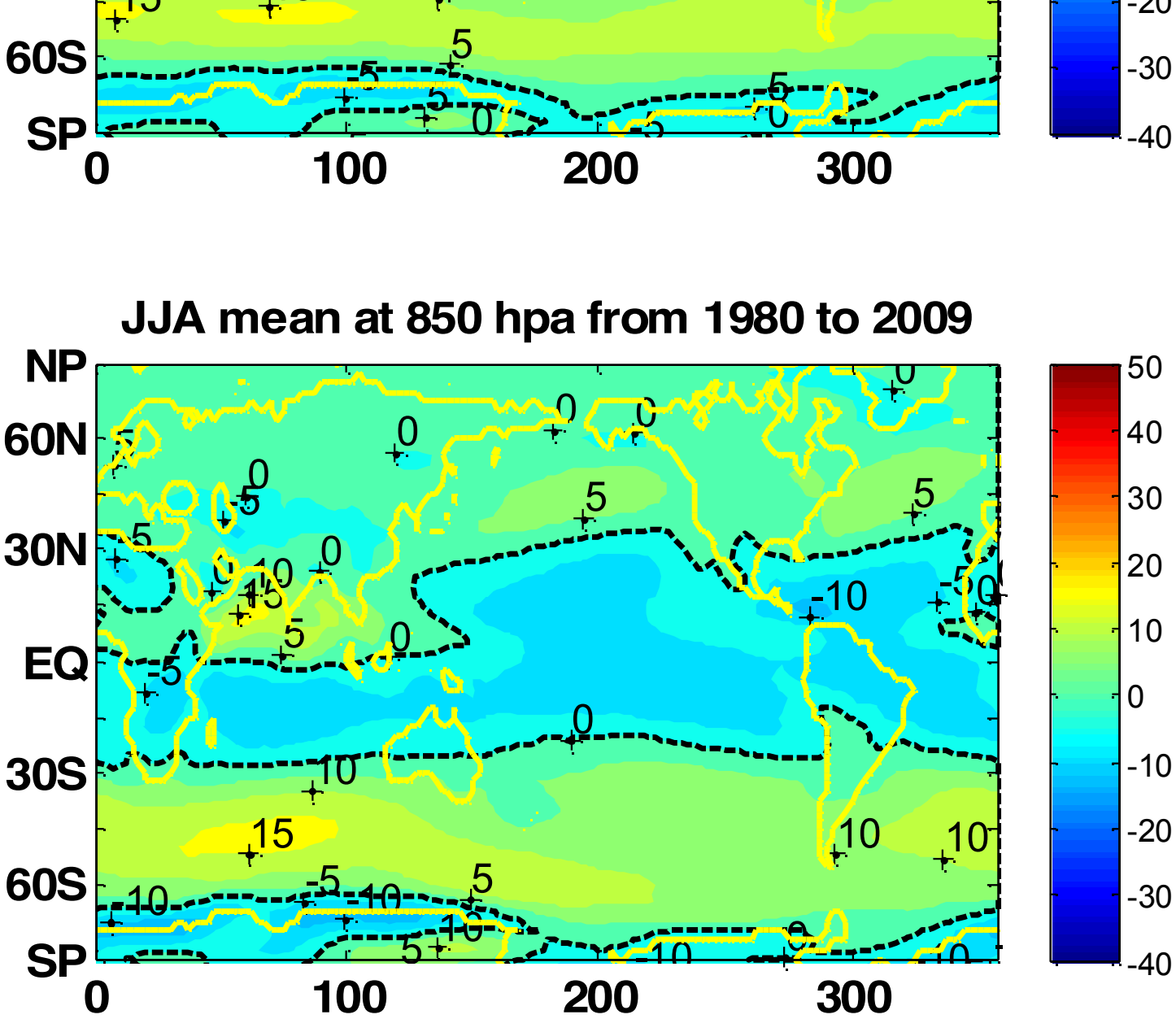


Question 2

- 风场－纬向差异:



- 风场


JJA mean at 850 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
SP
0
100
200
300
50
40
30
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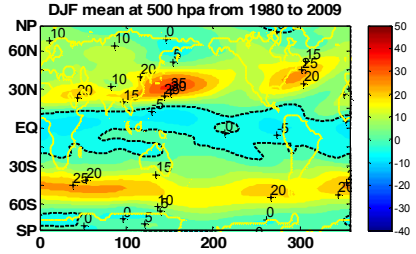
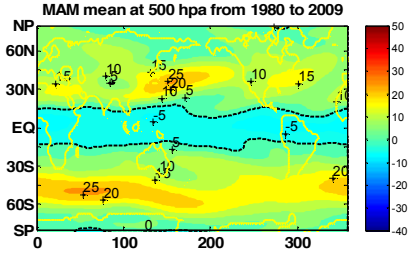
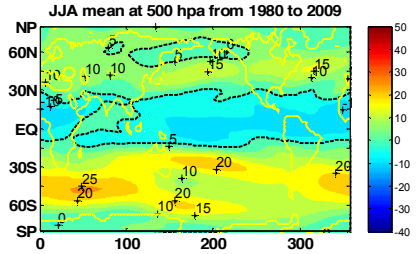
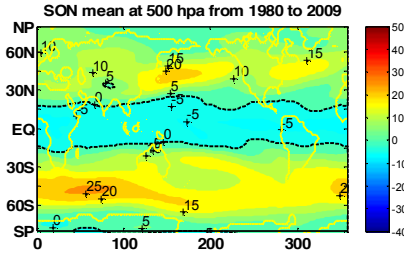
0
-10
-20
-30
-40

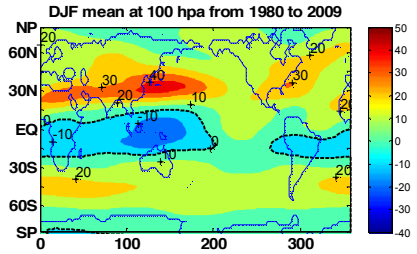
2

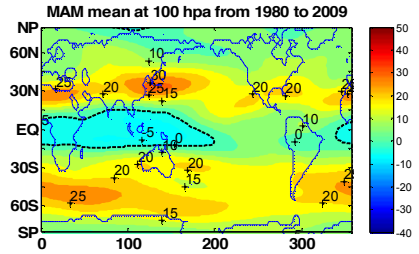

DJF mean at 500 hpa from 1980 to 2009

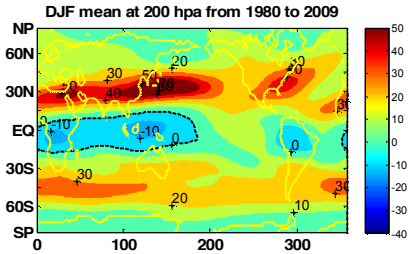

MAM mean at 500 hpa from 1980 to 2009

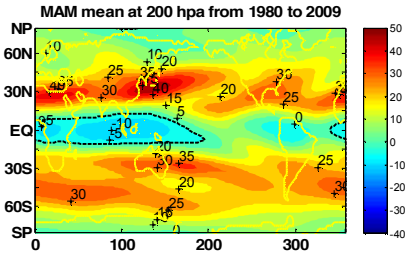

JJA mean at 500 hpa from 1980 to 2009

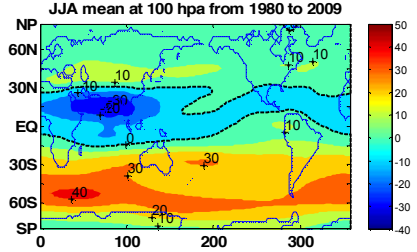

SON mean at 500 hpa from 1980 to 2009

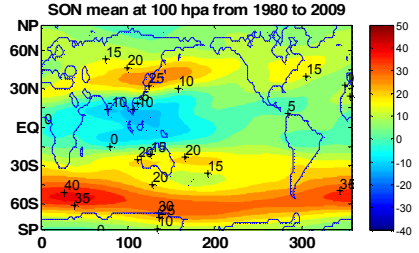

DJF mean at 100 hpa from 1980 to 2009

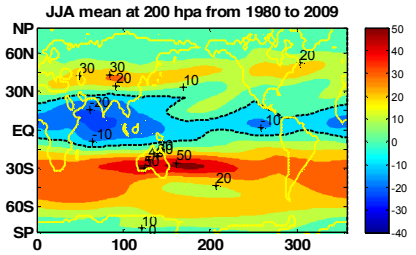

MAM mean at 100 hpa from 1980 to 2009

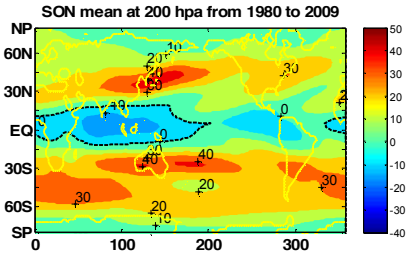

DJF mean at 200 hpa from 1980 to 2009


MAM mean at 200 hpa from 1980 to 2009

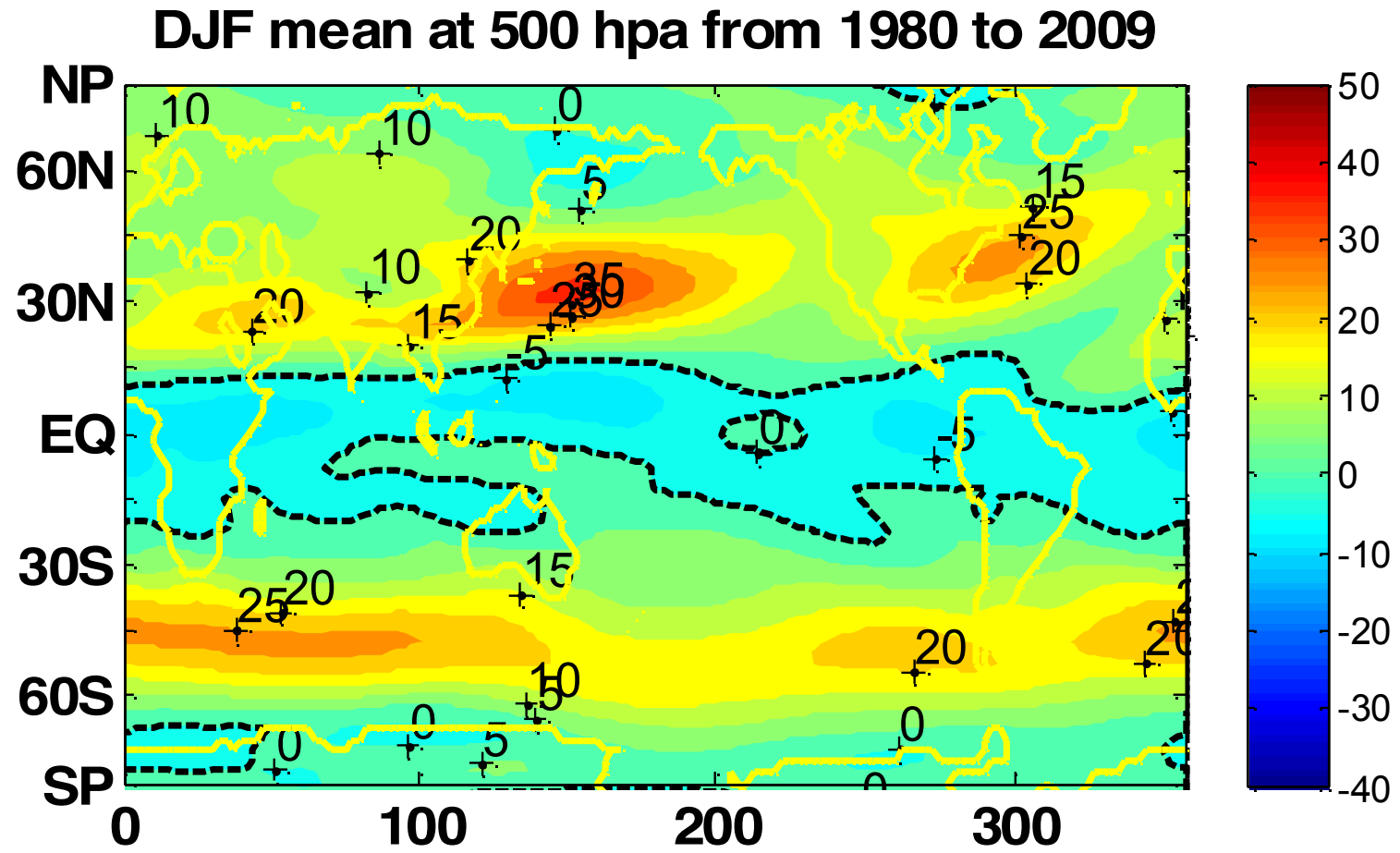

JJA mean at 100 hpa from 1980 to 2009


SON mean at 100 hpa from 1980 to 2009


JJA mean at 200 hpa from 1980 to 2009

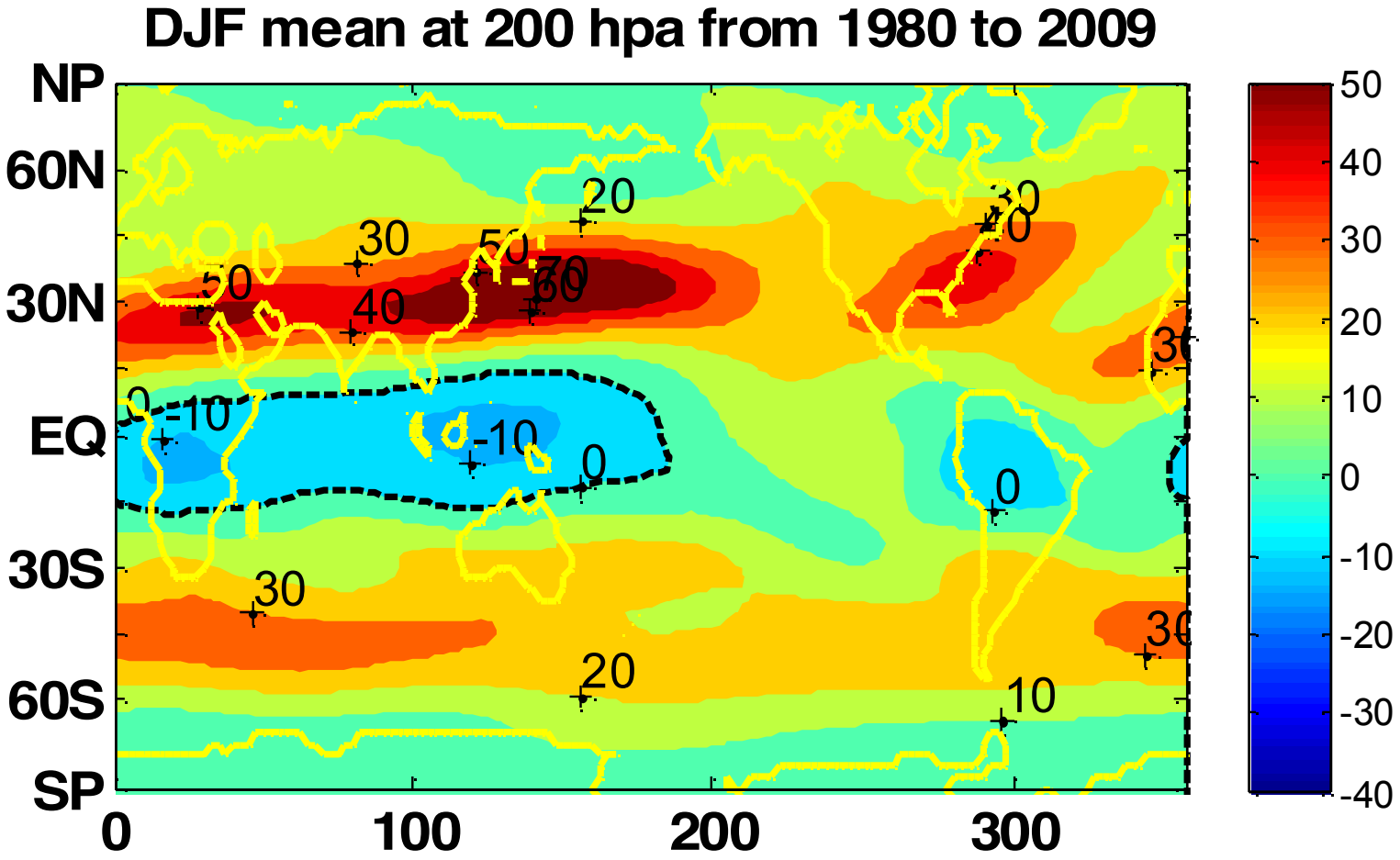

SON mean at 200 hpa from 1980 to 2009

Question 2



JJA mean at 500 hpa from 1980 to 2009

Question 2


DJF mean at 200 hpa from 1980 to 2009
NP
60N
30N
EQ
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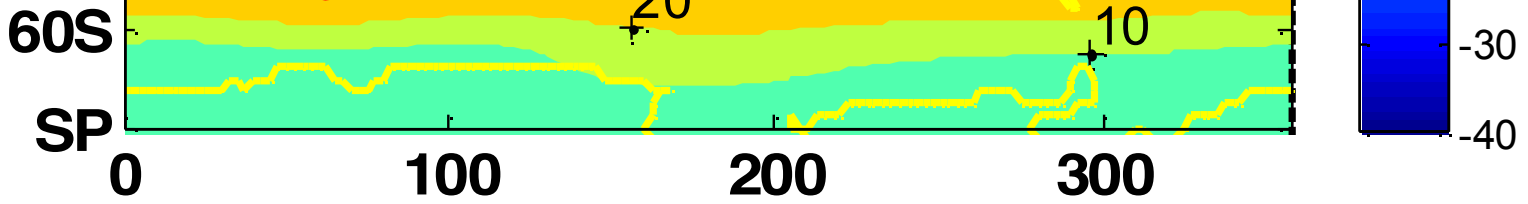
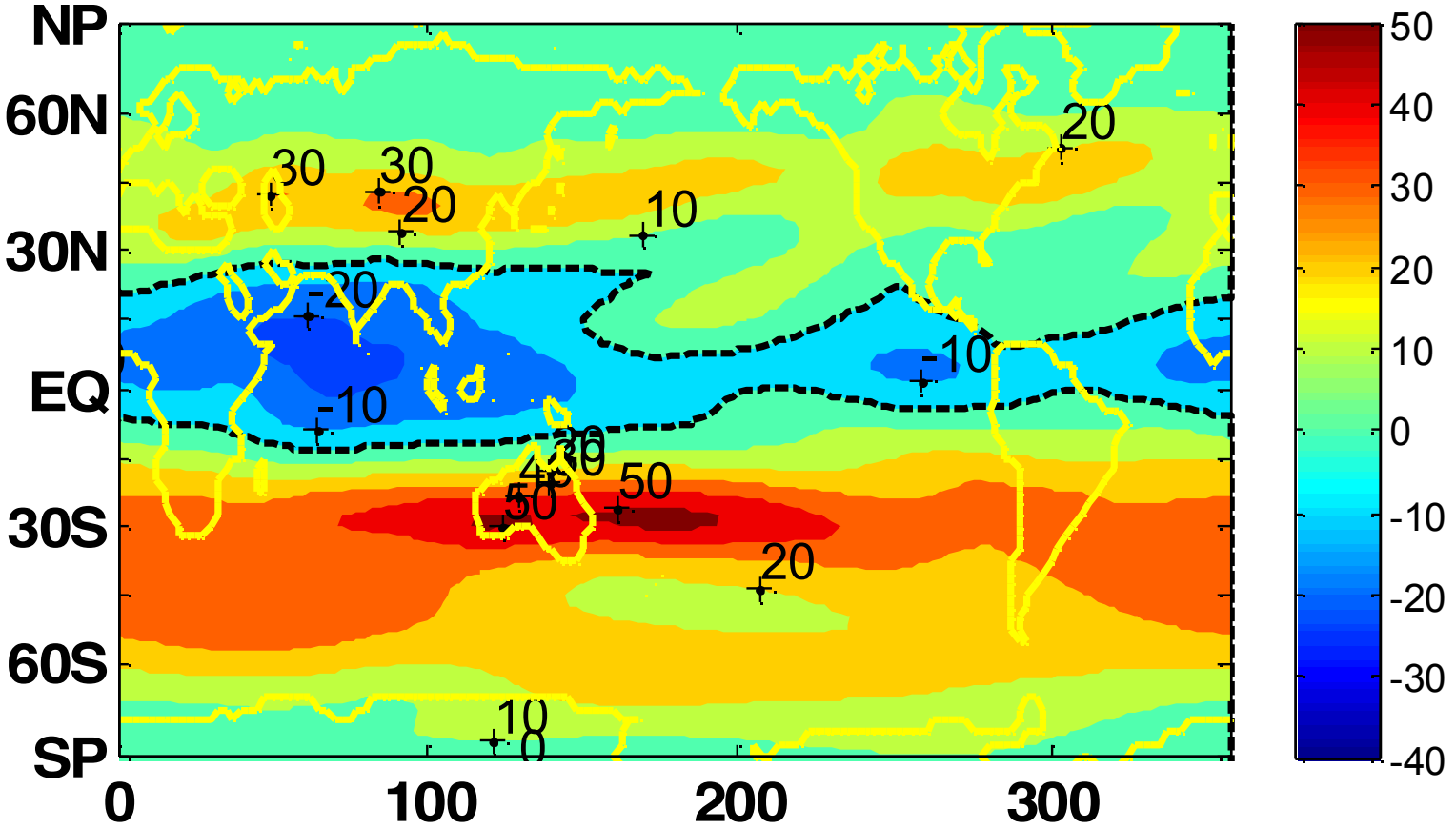
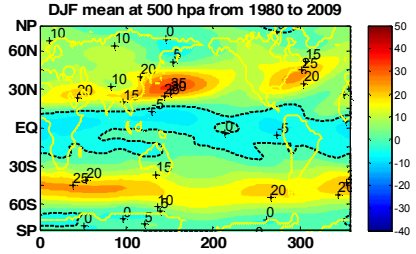
-40



JJA mean at 200 hpa from 1980 to 2009



2


DJF mean at 500 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
SP
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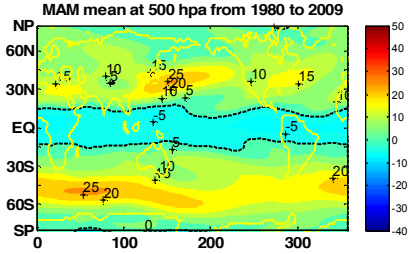
300


MAM mean at 500 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
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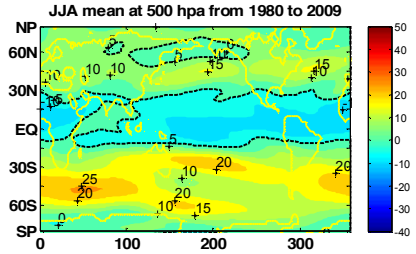
300


JJA mean at 500 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
SP
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100
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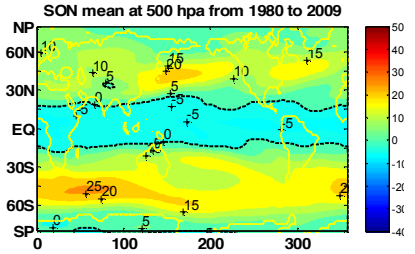
300


SON mean at 500 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
SP
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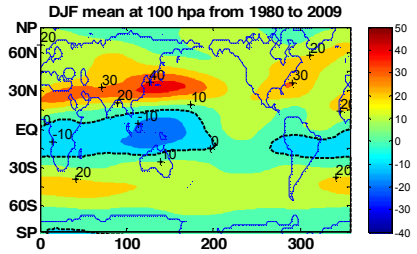
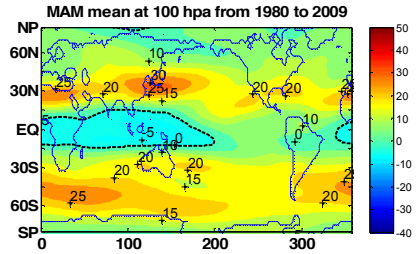
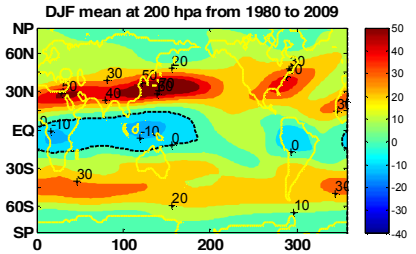
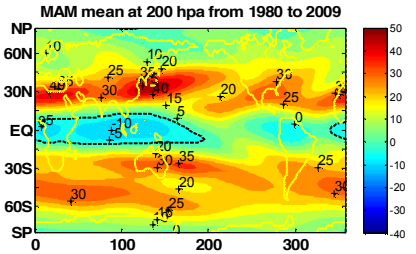
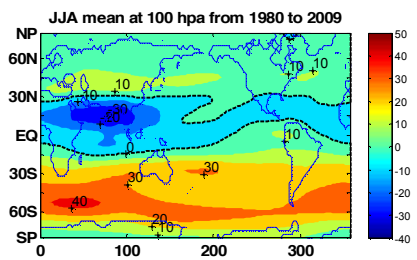
300

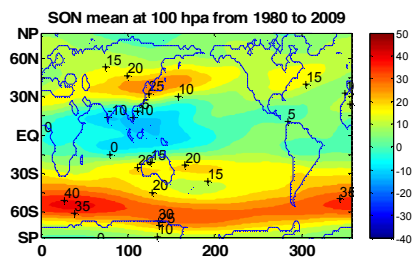

DJF mean at 100 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
SP
0
100
200
300

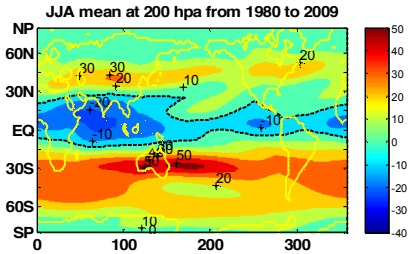

MAM mean at 100 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
SP
0
100
200
300

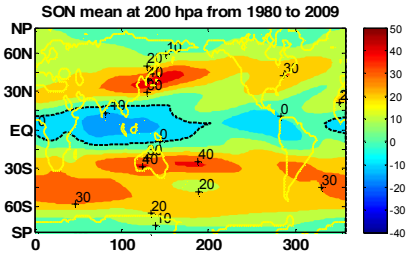

DJF mean at 200 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
SP
0
100
200
300


MAM mean at 200 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
SP
0
100
200
300


JJA mean at 100 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
SP
0
100
200
300


SON mean at 100 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
SP
0
100
200
300


JJA mean at 200 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
SP
0
100
200
300


SON mean at 200 hpa from 1980 to 2009
NP
60N
30N
EQ
30S
60S
SP
0
100
200
300

Sample Matlab file for Q1

```
%
%   This is a program to read NCEP-DOE II reanalysis monthly mean
% data using matlab's own functions, for any question plz contact
% yangzhang@nju.edu.cn
%
%-----------------------------------------------------------------
%
%--Below are parameters you have to input or vary to finish Q1
%--Input #1: the full path of the data file,
%            for temperature, use data file: air.mon.mean.nc
%            for zonal wind, use data file: uwnd.mon.mean.nc
path_data='C:\YOURPATH\air.mon.mean.nc';
%
%--Input #2: the year you want to average
%            This data covers from 1979/1 -- 2009/12
%            e.g. averaged from 1981 to 2000, input: year=[1981 2000]
%            DO NOT input any value smaller than 1980 (as winter including
%            Dec. of the previous year) and make sure that the first input
%            value is NOT LARGER than the latter one.
year=[1980 2000];
%
%--Input #3: the season you want to average
%            Winter (DJF), input: season=1
%            Spring (MAM), input: season=2
%            Summer (JJA), input: season=3
%            Fall   (SON), input: season=4
%            All year,     input: season=0
%
season=1;
%
%--YOU ARE DONE WITH THE INPUT!!! Just wait for the pics!
%
```

Sample Matlab file for Q1

```
%--STEP1: read nc files
%
ncid=netcdf.open(path_data,'NOWRITE');
[ndims,nvars,ngatts,unlimdimid] = netcdf.inq(ncid);
% number of dimensions, number of variables, number of global attributes,
% and the identity of the unlimited dimension, if any.
%
%---read info on lon,lat,lev
dimname=cell(1,5);
for i=1:ndims
 [dimname{i}, dimlen(i)] = netcdf.inqDim(ncid,i-1);
 %returns the name and length of a dimension
 %length of lon,lat,lev,time
end
lev=netcdf.getVar(ncid,0);
lat=netcdf.getVar(ncid,1);
lon=netcdf.getVar(ncid,2);
nbd=netcdf.getVar(ncid,3); % a dimension only appears in reanalysis II
%
%----Begins to read the variables
%--Read parameters
[varname,xtype,dimids,natts] = netcdf.inqVar(ncid,5);
%returns the name, datatype, dimensions IDs,
%and the number of attributes of the variable identified by varid.
%--ABOVE COMMAND IS OPTIONAL
%
scale=netcdf.getatt(ncid,5,'scale_factor');
offset=netcdf.getatt(ncid,5,'add_offset');
%--NOTE: var_real=var_read*scale+offset
%
```

Sample Matlab file for Q1

```
%
if (season==0)
    m_int=(year(1)-1979)*12; d_mon=(year(2)-year(1)+1)*12;
    tmp=double(...
        netcdf.getVar(...
        ncid,5,[0 0 0 m_int],[dimlen(1) dimlen(2) dimlen(3) d_mon])...
        ).*scale+offset;
else
    d_mon=(year(2)-year(1)+1)*3;
    i_mon=0;
    tmp=zeros(dimlen(1),dimlen(2),dimlen(3),d_mon);
    for y_ind=year(1):year(2)
        tmp(:,:,:,i_mon+(1:3))=double(...
            netcdf.getVar(...
            ncid,5,[0 0 0 (y_ind-1979)*12+(season-1)*3-1],...
            [dimlen(1) dimlen(2) dimlen(3) 3])...
            ).*scale+offset;
        i_mon=i_mon+3;
    end
end
var=squeeze(mean(tmp,4));
zonal_var=squeeze(mean(var,1));
clear tmp;
clear var;
%
```

Sample Matlab file for Q1

```
figure(1)
subplot(2,1,1)
npath=size(path_data,2);
if (path(npath-15)=='u')
    v=(-10:12)*5;
else
    v=(15:36)*10;
end
[C,h] = contourf(lat, lev,zonal_var',v);
p=get(h,'Children');
c=get(p,'Cdata');
set(p([c{:}]<0),'LineStyle','--');
set(p([c{:}]==0),'LineStyle','-','Linewidth',3);
clabel(C,'fontsize',14,'color','k');
xlim([-80,80]);
%colorbar;
set(gca, 'YDir', 'reverse');
set(gca,'Fontweight','bold','Fontsize',14);
ylabel('Pressure (hpa)');
set(gca,'xtick',[(-8:8)*10]);
set(gca,'xticklabel',...
        {'S.P.','','60S','','40S','','20S','','E.Q.','','20N','','40N','','
title([t_name{season+1},' from ',num2str(year(1)),' to ',num2str(year(2))]);
```