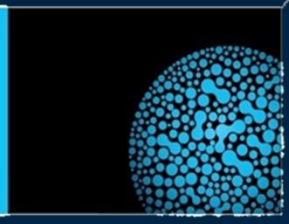
# What to do in hands-on session?

***We examine the impact of Boreal Summer Intraseasonal Oscillation (BSISO) on the climate in your country.***

# What did we do yesterday?



***Composite analysis using station data to show BSISO impact on local precipitation***

| Date | Task | Software | Source Code Path |
|---|---|---|---|
| 25 (Wed.) PM | • BSISO impact using station data | Fortran<br>GrADs | • \stn\ |
| 26 (Thu.) AM | • BSISO impact on atmospheric circulation | Fortran<br>GrADs | • \cir\ |
| 27 (Fri.) AM | • Lab | Fortran<br>GrADs | |
| 27 (Fri.) PM | • Presentation | - | - |

# How to do?

**Anomalies** → **Index** → **Composite** → **Transform** → **Display**

01.--------.f90
02.--------.f90

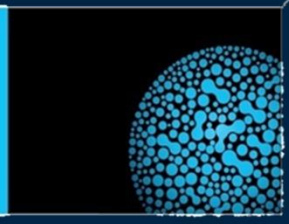
03.--------.f90

04.--------.f90
04.--------.f90

05.--------.f90
05.--------.f90
Stnmap –i 52.---.ctl

06.--------.gs
06.--------.gs

# What will we do today?



***Composite analysis using gridded data to show BSISO related large scale circulation pattern***

| Date | Task | Software | Source Code Path |
|---|---|---|---|
| 25 (Wed.) PM | • BSISO impact using station data | Fortran GrADs | • \stn\ |
| 26 (Thu.) AM | • BSISO impact on atmospheric circulation | Fortran GrADs | • \cir\ |
| 27 (Fri.) AM | • Lab | Fortran GrADs | |
| 27 (Fri.) PM | • Presentation | - | - |

# How to do?

**Anomalies** → **Index** → **Composite**

01.--------.f90
02.--------.f90

03.--------.f90

04.--------.f90
04.--------.f90

***Variables***

***- Outgoing Longwave Radiation***
***- 850 hPa Zonal Wind & Meridional Wind***
***- 200 hPa Zonal Wind & Meridional Wind***
***- 500 hPa Geopotential Height***
***- Mean sea level pressure***

**Transform** → **Display**

05.--------.f90
05.--------.f90
Stnmap –i 52.---.ctl

06.--------.gs
06.--------.gs

# Circulation fields

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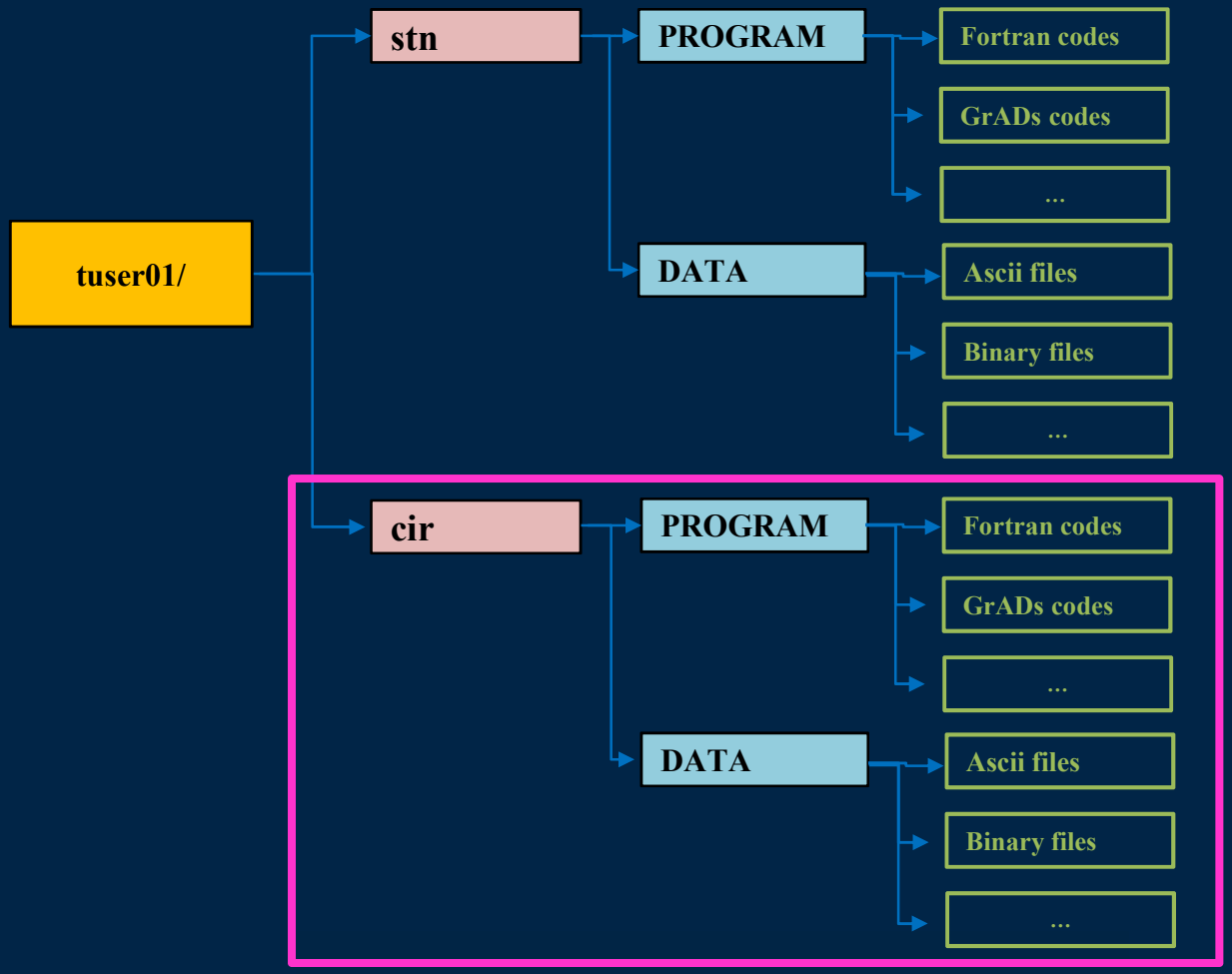
# Setup


tuser01/
stn
PROGRAM
Fortran codes
GrADs codes
...
DATA
Ascii files
Binary files
...
cir
PROGRAM
Fortran codes
GrADs codes
...
DATA
Ascii files
Binary files
...

# Data

| cir | stn |
|---|---|
| 41.**OLR**.198101201012.noLY | **31.P.KR_8110_sta.asc** |
| 41.**mslp**.198101201012.noLY | **51.station89.txt** |
| 41.**U850**.198101201012.noLY | |
| 41.**U200**.198101201012.noLY | 34.BSISO.INDEX.PHASE.txt |
| 41.**V850**.198101201012.noLY | |
| 41.**V200**.198101201012.noLY | 52.BSISO1.stn.comp.ctl |
| 41.**Z500**.198101201012.noLY | 52.BSISO2.stn.comp.ctl |
| | |
| 34.BSISO.INDEX.PHASE.txt | maskfile.MA |
| | mask.MA.ctl |

# PROGRAM

| cir | stn |
|---|---|
| 11.cir.ANO1.f90<br>12.cir.ANO2.f90 | 01.stn.ANO1.f90<br>02.stn.ANO2.f90 |
| 03.BSISO.PHS.amp1.5.MJJASO.f90 | 03.BSISO.PHS.amp1.5.MJJASO.f90 |
| 14.cir.BSISO1.COMP.f90<br>14.cir.BSISO2.COMP.f90 | 04.stn.BSISO1.COMP.f90<br>04.stn.BSISO2.COMP.f90 |
| | 05.stn.GSform.BSISO1.f90<br>05.stn.GSform.BSISO2.f90 |
| 16.cir.BSISO1.COMP.gs<br>16.cir.BSISO2.COMP.gs | 06.stn.BSISO1.COMP.gs<br>06.stn.BSISO2.COMP.gs |

# Anomaly Calculation

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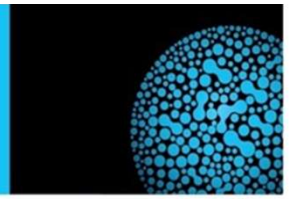
# 11.cir.ANO1.f90

***Removal of the first three harmonics in climatological annual cycle***

***#1. Extracting climatology***

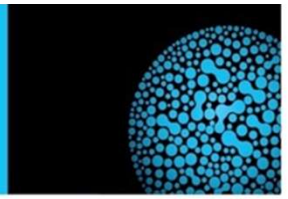
***#2. Extracting first three harmonics in climatological annual cycle***

# Anomaly [11.cir.ANO1.f90]



```
include  "./41.PARA.2D.H"
real    :: gd(nx,ny), ave(nx,ny), num(nx,ny)
real    :: xx(nx,ny,nday), yy(nday), xano(nday)
real    :: clim1(nx,ny,nday), clim2(nx,ny,nday)

open (1,file='../DATA/42.'//VNAME//'.DAY.ANOS1.noLY.51',form='unformatted',&
&       access='direct',recl=nx*ny*4,status='unknown')
open (2,file='../DATA/42.'//VNAME//'.DAY.ANOS1.CTL',status='unknown')

open (11,file='../DATA/41.'//VNAME//'.198101201012.noLY',form='unformatted',&
&       access='direct',recl=nx*ny*4,status='old')

open (12,file='../DATA/42.'//VNAME//'.DAY.CLIM.H.noLY.51',form='unformatted',&
&       access='direct',recl=nx*ny*4,status='unknown')
open (13,file='../DATA/42.'//VNAME//'.DAY.CLIM.noLY.51',form='unformatted',&
&       access='direct',recl=nx*ny*4,status='unknown')

!-------Climatology (1981-2010)
do 100 iday = 1 , nday
      ave = 0. ; num = 0.
   do iyr = nyri , nyrf
       read(11,rec=(iyr-nyri)*nday+iday) gd
       call JAVE1(ave,num,gd,nx,ny,dmiss)
   enddo
       call JAVE2(ave,num,nx,ny,dmiss)
       do jj = 1 , ny; do ii = 1 , nx
        xx(ii,jj,iday) = ave(ii,jj)
       enddo;enddo
      write(13,rec=iday) ave
100 continue
```

# Anomaly [41.PARA.2D.H]



```
integer,parameter :: nx=144, ny=73
integer,parameter :: nyri=1981, nyri2=1981, nyrf=2010, nyr=nyrf-nyri
integer,parameter :: nday=365, ndayf=365
integer,parameter :: ntot=nyr*nday+ndayf
character*3       :: VNAME
character*8       :: DIR
data                 VNAME/"OLR"/
data                 DIR/"../DATA/"/
data                 dmiss/32766/
~
```

*MSLP*
*U200*
*U850*
*V200*
*V850*
*Z500*

**Analysis period (Start year, End year)**
**Variable name**
**Path**
**# of characters for variable**
**# of characters for path**

# [ctl] Accompanying data descriptor file

*../DATA/*

*vi 42.OLR.DAY.ANOS1.CTL*

***Modify ctl file which carries an anomaly field***

*ga-> open 42.OLR.DAY.ANOS1.ctl*

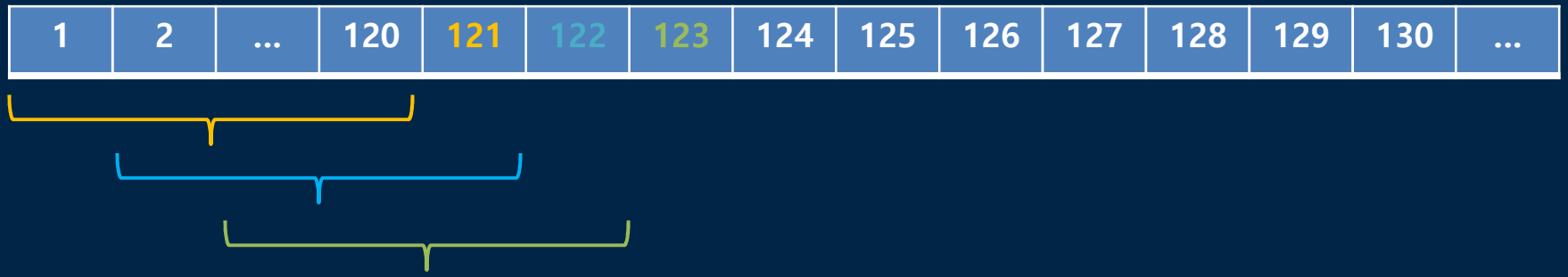
*ga-> d OLR*

***Check the anomaly pattern***

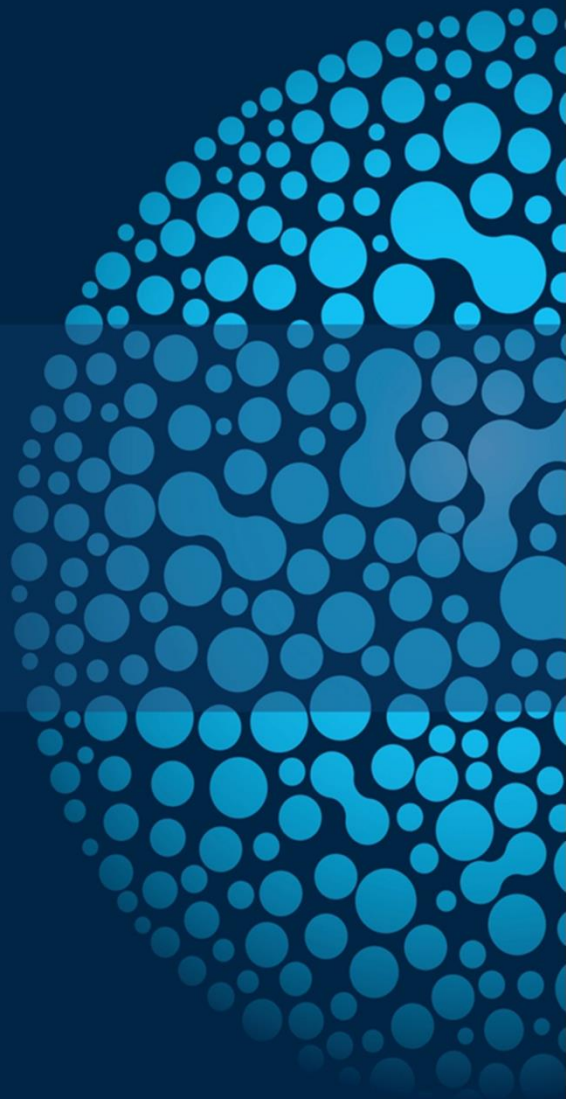
# 12.cir.ANO2.f90

***Removal of the effect of ENSO signal through subtracting last 120-day mean***

Julian day



# Composite Analysis



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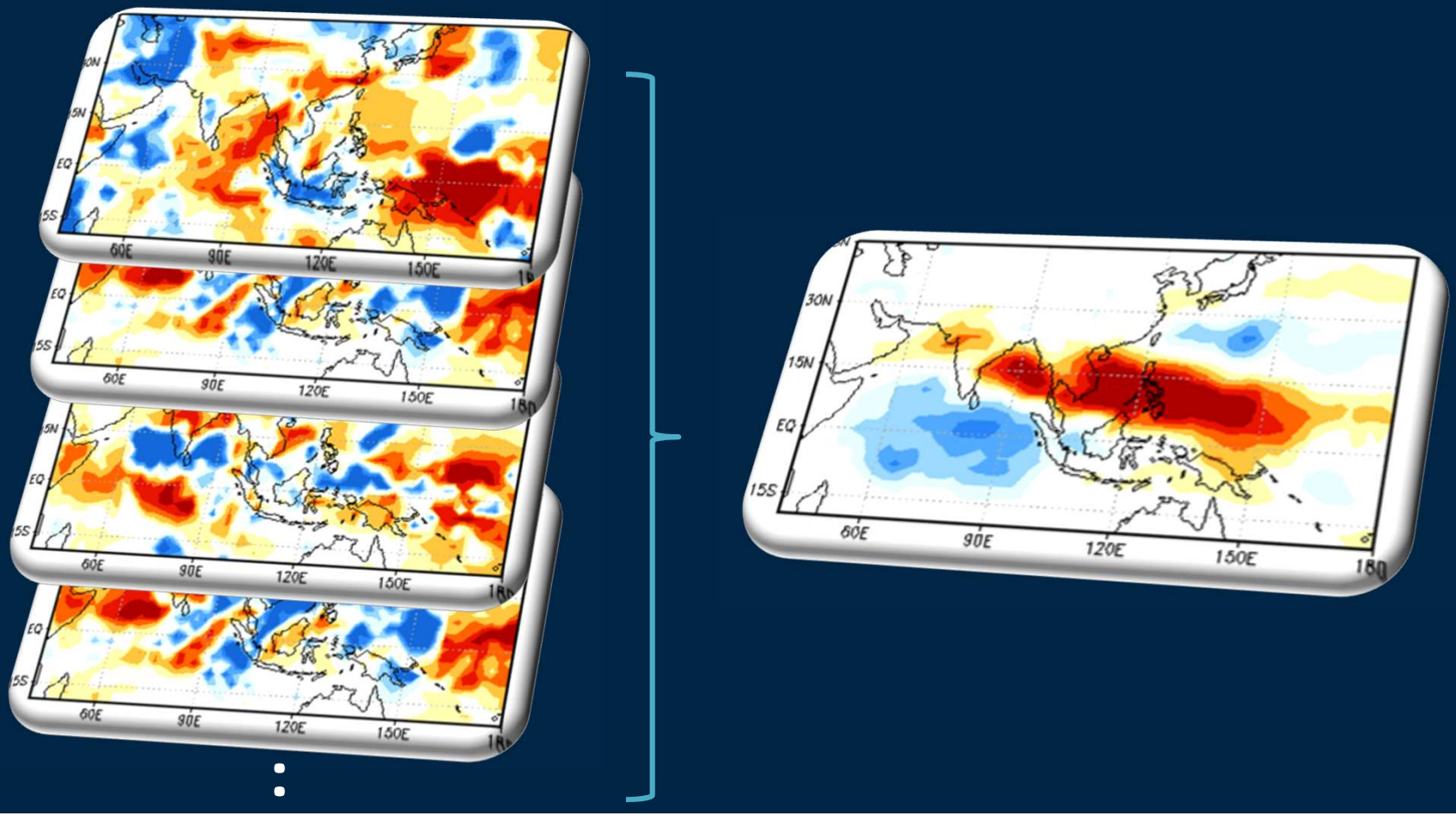
# Flow

***#1. Divide the BSISO indices into 8 phases***

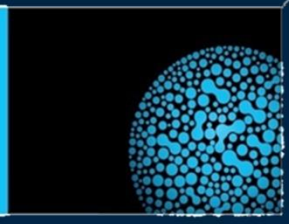
***#2. Composite for circulation variables***

# 14.cir.BSISO1.COMP.f90
# 14.cir.BSISO2.COMP.f90

***#2. Composite analysis for grid data to show BSISO related large circulation patterns***



# 03.BSISO.PHS.amp1.5.MJJASO.f90



## *#1. Divide the BSISO indices into 8 phases*

### BSISO1.MJJASO.amp1.5.Phase1

| | | | | |
|---|---|---|---|---|
| 1981 200 | 0.021 | -1.636 | 1.636 | 1 |
| 1981 201 | 0.414 | -1.457 | 1.515 | 1 |
| 1981 202 | 0.845 | -1.356 | 1.598 | 1 |
| 1981 234 | 0.039 | -1.610 | 1.610 | 1 |
| 1981 235 | 0.383 | -1.642 | 1.686 | 1 |
| 1981 295 | 0.829 | -1.304 | 1.545 | 1 |
| 1982 143 | 1.117 | -1.350 | 1.752 | 1 |
| 1982 261 | 0.755 | -1.712 | 1.871 | 1 |
| 1982 262 | 0.869 | -1.493 | 1.727 | 1 |
| 1982 295 | 0.063 | -1.909 | 1.910 | 1 |
| 1982 296 | 0.431 | -1.851 | 1.901 | 1 |
| 1982 297 | 0.739 | -1.756 | 1.905 | 1 |
| 1982 298 | 0.900 | -1.203 | 1.502 | 1 |
| 1982 299 | 1.084 | -1.106 | 1.549 | 1 |
| 1983 233 | 0.555 | -1.441 | 1.544 | 1 |
| ... | | | | |

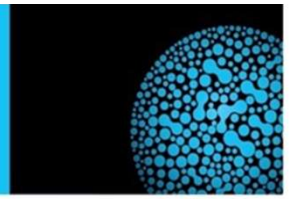
x8

### BSISO2.MJJASO.amp1.5.Phase1

| | | | | |
|---|---|---|---|---|
| 1981 198 | 0.949 | -1.812 | 2.046 | 1 |
| 1981 208 | 0.674 | -1.648 | 1.781 | 1 |
| 1981 209 | 1.075 | -1.817 | 2.111 | 1 |
| 1981 212 | 1.841 | -1.844 | 2.606 | 1 |
| 1981 213 | 1.705 | -2.640 | 3.143 | 1 |
| 1981 214 | 1.154 | -2.175 | 2.462 | 1 |
| 1981 257 | 0.771 | -1.626 | 1.799 | 1 |
| 1981 258 | 1.397 | -1.787 | 2.268 | 1 |
| 1981 290 | 0.256 | -1.576 | 1.597 | 1 |
| 1981 299 | 1.003 | -1.527 | 1.827 | 1 |
| 1982 138 | 0.034 | -1.619 | 1.619 | 1 |
| 1982 144 | 1.066 | -1.339 | 1.712 | 1 |
| 1982 145 | 1.326 | -1.541 | 2.033 | 1 |
| 1982 251 | 0.855 | -1.254 | 1.518 | 1 |
| 1983 196 | 1.519 | -1.551 | 2.171 | 1 |
| ... | | | | |

x8

# Composite [14.cir.BSISO1.COMP.f90]



*ex> Composite OLR for BSISO1*

## Input: BSISO1 index + anomalies

BSISO1.MJJASO.amp1.5.Phase1~8

43.OLR.DAY.ANOS2.noLY.51

## Output: Composite anomalies + ctl file

45.OLR.19812010.MJJASO.BSISO1.amp1.5.COMP.bin

45.OLR.19812010.MJJASO.BSISO1.amp1.5.COMP.CTL

# Drawing using GrADS

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# Draw [16.cir.BSISO1.COMP.gs]

***ex> OLR Composite anomaly for BSISO1***

## Input: Composite anomalies + ctl file

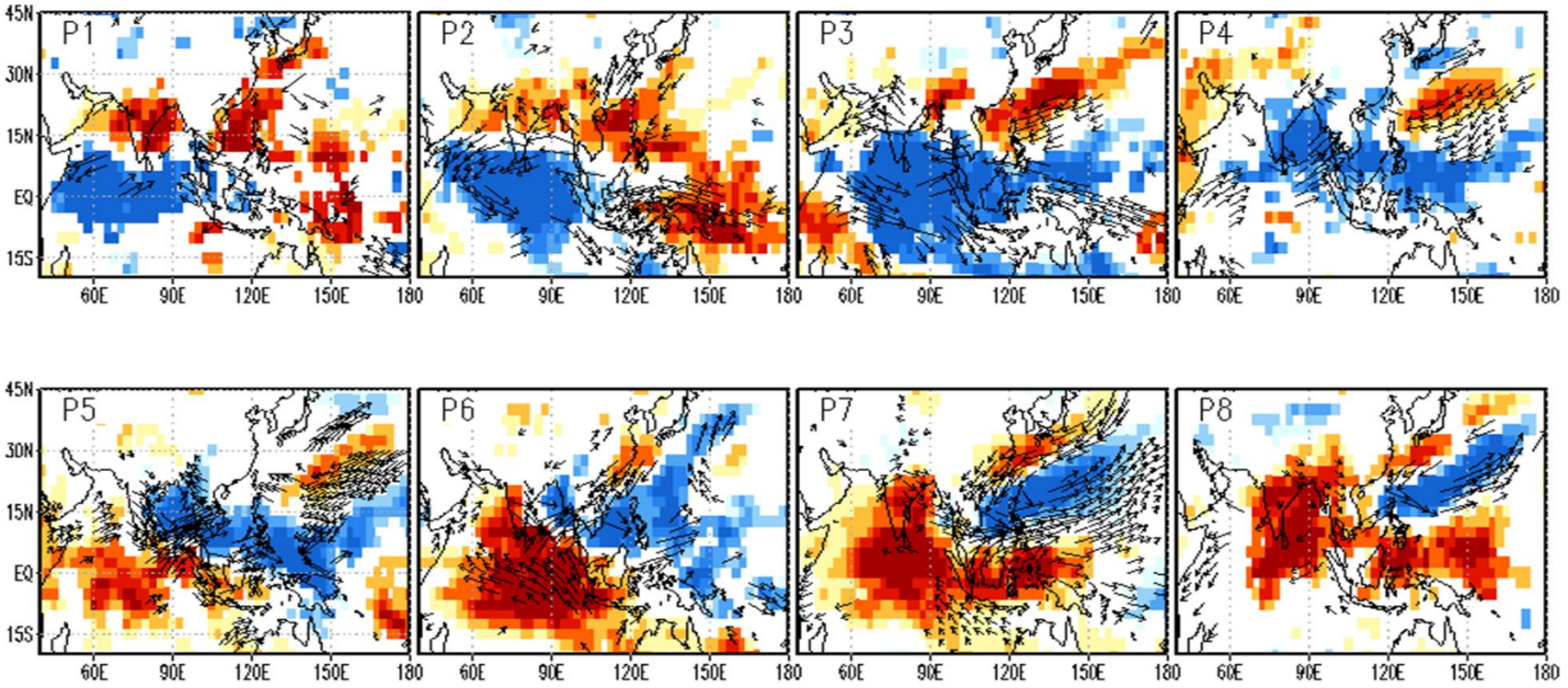
45.OLR.19812010.MJJASO.BSISO1(2).amp1.5.COMP.bin
45.OLR.19812010.MJJASO.BSISO1(2).amp1.5.COMP.CTL

## Output: Figures

OLR.BSISO1.MJJASO.COMP.----.gif
OLR.BSISO2.MJJASO.COMP.----.gif

**Make sure whether your .CTL & .gs files are set up correctly. Modify your .gs file to display your result (e.g., color level, target domain, etc)**

# Draw [16.cir.BSISO1.COMP.gs]



# Display using GrADS

*To make your figures more beautiful:*

- *GrADS User's Guide (http://cola.gmu.edu/grads/gadoc/users.html)*

- *GrADS Documentation Index (http://cola.gmu.edu/grads/gadoc/gadocindex.html)*