



Climate Data Analysis Module: CDA2- Extremes

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Variables analyzed: Daily precipitation; maximum and minimum temperature

Analyses and Visualization of:

- Spatial distribution of daily extreme precipitation events and interannual variations
- Spatial distribution of daily extreme temperature events
- Spatial patterns of diurnal temperature range for winter and summer seasons
- Annual cycle of diurnal range from model outputs.

Scripts provided: Analyses using CDO (Climate Data Operators) and visualization using GrADS (Graphical Analysis and Display System)

CORDEX-South Asia Evaluation Runs available for Hands On Analyses & Visualization

Institute	Model	Experiment	Resolution	Driving Model	Driving Experiment	Period
IITM	WRF3.1.1	BMJ Cu Scheme	50 km; Mercator	ERA-Interim	Global 0.75°	1989-2007
IITM	RegCM3.0	Grell Cu Scheme	50 km; Mercator	ERA-Interim	Global 1.5°	1989-2007
IITM	RegCM4.1.1	Mixed Cu Scheme (Grell-Land & Emanuel-Ocean)	50 km; Mercator	ERA-Interim	Global 1.5°	1989-2007
IITM	LMDZ AGCM	Emanuel Cu Scheme	35 km; Variable	ERA-Interim	Nudged with ERA-Interim	1989-2008
IITM	LMDZ AGCM	Tiedtke Cu Scheme	35 km; Variable	ERA-Interim	Nudged with ERA-Interim	1989-2008

- All RCM outputs regridded on a common region and 0.5° lat./lon. Grid
- Variables analysed: Monthly mean Precipitation and Surface Air Temperature

Structure of Files

User : cordex
Passwd: abc123

DATA

OBS- Observation Data -Monthly
RegCM/LMDZ/ARW- Model Data -Monthly
(1989-2005)

PATH: /gpfs1/home/cordex/

Daily Files (1996-2005)

PATH: /gpfs1/home/cordex/OBS/DAILY

Scripts

Folder :scripts
CDA1/CDA2/CDA3

**Make respective folder for each groups & copy the scripts
to the directory**

Spatial distribution of daily extreme precipitation events and interannual variations

File: CDA2/plot1/heavy-precip.cdo

•Select JJAS months

```
cdo -selmon,6/9/gpfs1/home/cordex/OBS/DAILY/APHRO_precip_day_1996-2005-WA.nc APHRO_precip_day_1996-2005-jjas.nc
```

•Frequency count of rainfall exceeding 20mm in all time step

```
cdo -eca_r20mm APHRO_precip_day_1996-2005-jjas.nc eca_r20mm.nc
```

•Splitting years

```
cdo -splityear APHRO_precip_day_1996-2005-jjas.nc APHRO_
```

•Find frequency for respective years

```
cdo -eca_r20mm APHRO_1996.nc eca_r20mm-1996.nc
```

```
cdo -eca_r20mm APHRO_1997.nc eca_r20mm-1997.nc
```

.

.

```
cdo -eca_r20mm APHRO_2005.nc eca_r20mm-2005.nc
```

•Merge files

```
cdo -mergetime eca_r20mm-1996.nc ..... eca_r20mm-2005.nc eca_r20mm-year.nc
```

•Select an area

```
cdo -sellonlatbox,72,76,12,22 eca_r20mm-year.nc eca_r20mm-year-WG.nc
```

•Area average

```
cdo -fldsum eca_r20mm-year-WG.nc eca_r20mm-year-WG-count.nc
```

•Set time step

```
cdo -r -setaxis,1996-07-15,00:00,1year eca_r20mm-year-WG-count.nc eca_r20mm-year-WG-count-n.nc
```

File: CDA2/plot1/heavy-precip.gs

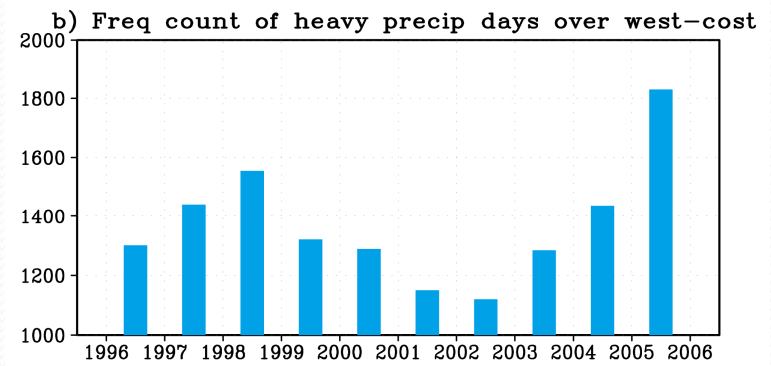
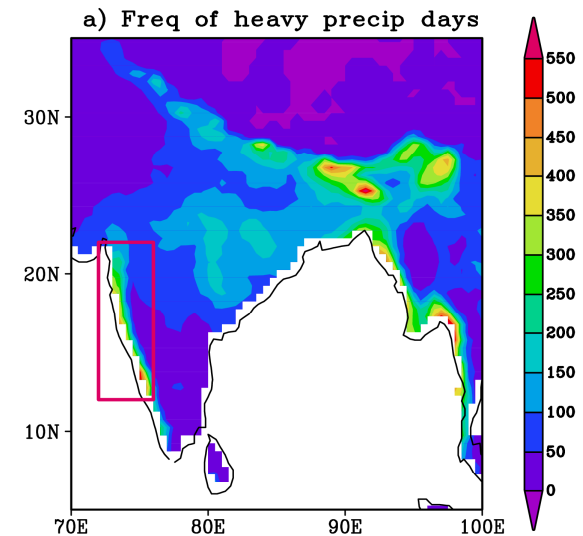
•GrADS script to plot & prepare output in EPS format

File: CDA2/plot1/heavy-precip.sh

•Unix shell script for CDO analysis & GrADS output

Exercise:

•Change the threshold to 30mm and find the frequency and for interannual variability change the area to central India



Spatial distribution of daily extreme temperature events

File: CDA2/plot2/cons-summer-day.index.cdo

•Select MAM months

```
cdo -selmon,3/5 /gpfs1/home/cordex/OBS/DAILY/IMD_maxT-1996-2005.nc maxT-1996-2005-mam.nc
```

•Frequency count of temperature events exceeding 40C in all time step

```
cdo -eca_csu,40 maxT-1996-2005-mam.nc eca_csu-40.nc
```

•Split years

```
cdo -splityear maxT-1996-2005-mam.nc maxT_
```

•Find frequency for respective years

```
cdo -eca_csu,40 maxT_1996.nc eca_csu-40_1996.nc
```

.

.

```
cdo -eca_csu,40 maxT_2005.nc eca_csu-40_2005.nc
```

•Merge files

```
cdo -mergetime eca_csu-40_1996.nc ..... eca_csu-40_2005.nc eca_csu-40_1996-2005.nc
```

•Select an area

```
cdo -sellonlatbox,75,85,15,25 eca_csu-40_1996-2005.nc eca_csu-40_1996-2005-area.nc
```

•Area average

```
cdo -fldsum eca_csu-40_1996-2005-area.nc eca_csu-40_1996-2005-count.nc
```

•Set time step

```
cdo -r -setaxis,1996-04-15,00:00,1year eca_csu-40_1996-2005-count.nc eca_csu-40_1996-2005-count-n.nc
```

File: CDA2/plot2/cons-summer-day.index.gs

•GrADS script to plot & prepare output in EPS format

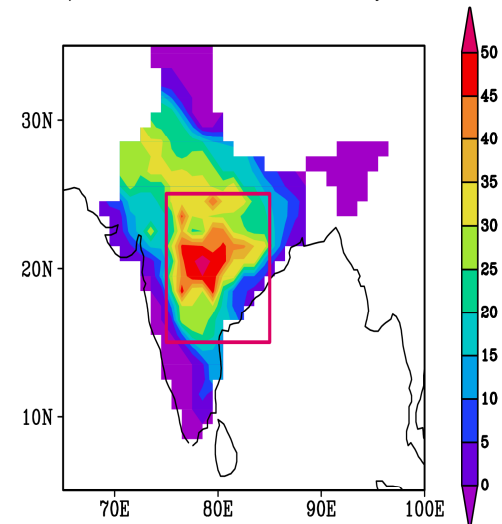
File: CDA2/plot2/cons-summer-day.index.gs

•Unix shell script for CDO analysis & GrADS output

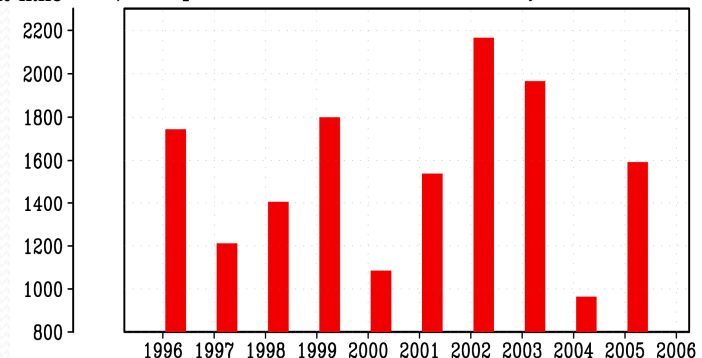
Exercise:

•Select JF season and find out the frequency count of temperature thresholds exceeding 30C

a) Consecutive summer day index



b) Freq count of conse summer days over C-India



Diurnal temperature range for winter and summer seasons

File: CDA2/plot3/diurnal-temp-reange.cdo

•Select MAM months

```
cdo -selmon,3,4,5 /gpfs1/home/cordex/OBS/DAILY/IMD_minT-1996-2005.nc minT-1996-2005-mam.nc  
cdo -selmon,3,4,5 /gpfs1/home/cordex/OBS/DAILY/IMD_maxT-1996-2005.nc maxT-1996-2005-mam.nc
```

•Average for entire time period

```
cdo -timmean minT-1996-2005-mam.nc minT-1996-2005-mam-mean.nc  
cdo -timmean maxT-1996-2005-mam.nc maxT-1996-2005-mam-mean.nc
```

•Difference between Tmax and Tmin

```
cdo -sub maxT-1996-2005-mam-mean.nc minT-1996-2005-mam-mean.nc diurnal-range-mam.nc
```

Repeat the same for DJF season.

File: CDA2/plot3/diurnal-temp-reange.gs

•GrADS script to plot & prepare output in EPS format

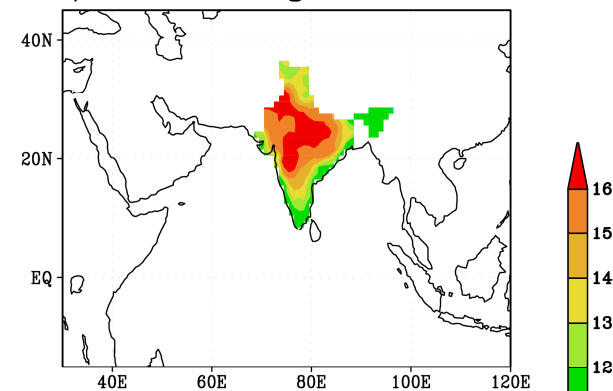
File: CDA2/plot3/diurnal-temp-reange.sh

•Unix shell script for CDO analysis & GrADS output

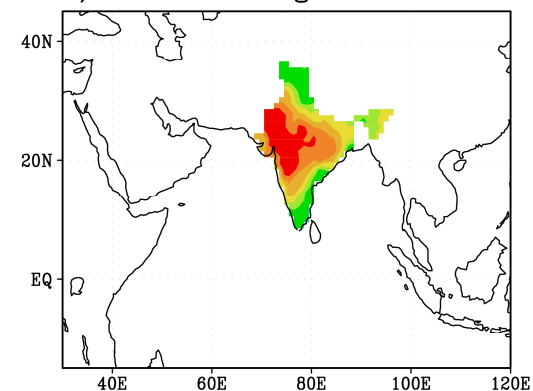
Exercise:

Analyse the Diurnal range for the yearly mean temperature

a) Diurnal Range MAM season



b) Diurnal Range DJF season



GrADS: COLA/IGES

Annual cycle of Diurnal temperature range –multi model

File: CDA2/plot4/ anual-cycle-diurnal-reange.cdo

- Compute monthly climatology

```
cdo -ymonmean /gpfs1/home/cordex/OBS/DAILY/CRU_mon_t2m_max_1989-2005-WA.nc cru_t2m_max.nc  
cdo -ymonmean /gpfs1/home/cordex/OBS/DAILY/CRU_mon_t2m_min_1989-2005-WA.nc cru_t2m_min.nc
```

- Difference between Tmax and Tmin

```
cdo -sub cru_t2m_max.nc cru_t2m_min.nc diurnal-range-cru.nc
```

- Select the respective regions and area average

```
cdo -fldmean -sellonlatbox,70,90,10,25 diurnal-range-cru.nc diurnal-range-cru-IND.nc
```

- Set time axis

```
cdo -r -settaxis,2000-01-15,00:00,1mon diurnal-range-cru-IND.nc diurnal-range-cru-IND-n.nc
```

File: CDA2/plot4/ anual-cycle-diurnal-reange.gs

- GrADS script to plot & prepare output in EPS format

File: CDA2/plot4/ anual-cycle-diurnal-reange.sh

- Unix shell script for CDO analysis & GrADS output

Exercise:

- Please bring out the differences in the simulations

